DCCUMENT RESUME

ED 036 639 VT 010 306

AUTHOR	PHILLIPS, DCNALD S.; BRIGGS, LLOYD D.
IITLE	REVIEW AND SYNTHESIS OF RESEARCH IN TECHNICAL EDUCATION. SECOND EDITION. RESEARCH SERIES NO. 47.
INSTITUTION	CHIC STATE UNIV., COLUMBUS. CENTER FOR VOCATIONAL AND TECHNICAL EDUCATION.
SPCNS AGENCY	OFFICE CF EDUCATION (DHEW), WASHINGTON, D.C. BUREAU OF RESEARCH.
PUB DATE	CCT 69
NOTE	50P.
AVAILABLE FROM	THE CENTER FOR VCCATIONAL AND TECHNICAL EDUCATION, THE OHIO STATE UNIVERSITY, 1900 KENNY ROAD, COLUMBUS, OHIO 43210 ($2.25)
EDRS PRICE	EDRS PRICE MF-$0.25 HC-$2.50
DESCRIPTORS	*BIBLIOGRAPHIES, CURRICULUM DEVELOPMENT, EDUCATICNAL ADMINISTRATION, EDUCATIONAL EQUIPMENT, EDUCATIONAL FACILITIES, EDUCATIONAL PHILOSOPHY, EDUCATIONAL PROGRAMS, *EDUCATIONAL RESEARCH, INSTRUCTIONAL MATERIALS, LEARNING PROCESSES, LITERATURE REVIEWS, MANPOWER DEVELOPMENT, PROGRAM EVALUATION, *RESEARCH REVIEWS (PUBLICATICNS), STUDENT PERSONNEL SERVICES, *SYNTHESIS, TEACHER EDUCATION, TEACHING METHODS, *TECHNICAL EDUCATION

ABSTRACT

THIS DOCUMENT PROVIDES AN ANALYSIS AND SYNTHESIS CF SCME OF THE RESEARCH IN TECHNICAL EDUCATION SINCE AUGUST 1966, AND IN SOME INSTANCES INCLUDES ARTICLES PUBLISHED PRICR TO 1966 WHICH WERE JUDGED TO BE SIGNIFICANT FOR SHOWING TRENDS OR MAKING COMPARISONS. AN OVERVIEW OF RESEARCH IS PROVIDED IN THE FOLLOWING AREAS: (1) PHILOSOPHY, (2) MANPOWER NEEDS, (3) EDUCATIONAL PROGRAMS, (4) CURRICULUM, (5) STUDENT PERSCNNEL SERVICES, (6) EVALUATION, (7) ADMINISTRATICN AND SUPERVISION, (8) TEACHER EDUCATION, (9) LEARNING PROCESSES AND IEACHING METHCDS, (10) INSTRUCTIONAL MATERIALS AND DEVICES, (11) FACILITIES, AND (12) RESEARCH. IT WAS CONCLUDED THAT: (1) IN GENERAL, MUCH OF THE REPORTED RESEARCH SUFFERS FROM DEFICIENCIES IN DESIGN AND METHODOLOGY, (2) DESCRIPTIVE RESEARCH STUDIES HAVE LIMITED VALUE BEYOND THE SITUATION IN WHICH THEY WERE CONDUCTED, (3) LIMITED INFORMATION WAS AVAILABLE ABOUT DEVELOPMENT AND VALIDATICN OF QUESTICNNAIRES AND CPINICNAIRES WHEN USED, (4) RESEARCH STUDIES DEALT WITH SMALL SEGMENTS OF LARGE PROBLEMS AND TENDED TO BE TERMINAL IN NATURE, AND (5) THE AMOUNT OF SIGNIFICANT RESEARCH IN TECHNICAL EDUCATION IS STILL QUITE LIMITED. AN EXTENSIVE BIBLICGRAPHY CF THE REVIEWED LITERATURE IS APPENDED. THE FIRST REVIEW OF THIS SUBJECT COVERING PERIOD PRICR TO 1966 IS AVAILABLE AS ED 011 559. (GR)

ED036639

Research Series No. 47 (C1)

review and
synthesis of research in

TECHNICAL EDUCATION

second edition

ERIC Clearinghouse
THE CENTER FOR VOCATIONAL AND TECHNICAL EDUCATION
THE OHIO STATE UNIVERSITY, 1900 Kenny Rd., Columbus, Ohio 43210

ED036639

The Center for Vocational and Technical Education has been established as an independent unit on The Ohio State University campus with a grant from the Division of Comprehensive and Vocational Education Research, U. S. Office of Education. It serves a catalytic role in establishing consortia to focus on relevant problems in vocational and technical education. The Center is comprehensive in its commitment and responsibility, multidisciplinary in its approach, and interinstitutional in its program.

The major objectives of The Center follow:

1. To provide continuing reappraisal of the role and function of vocational and technical education in our democratic society;

2. To stimulate and strengthen state, regional, and national programs of applied research and development directed toward the solution of pressing problems in vocational and technical education;

3. To encourage the development of research to improve vocational and technical education in institutions of higher education and other appropriate settings;

4. To conduct research studies directed toward the development of new knowledge and new applications of existing knowledge in vocational and technical education;

5. To upgrade vocational education leadership (state supervisors, teacher educators, research specialists, and others) through an advanced study and inservice education program;

6. To provide a national information retrieval, storage, and dissemination system for vocational and technical education linked with the *E*ducational *R*esources *I*nformation *C*enter located in the U. S. Office of Education.

ED036639

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

Research Series No. 47

REVIEW AND SYNTHESIS OF RESEARCH IN TECHNICAL EDUCATION

Second Edition

Donald S. Phillips
Associate Professor, Department of Technical Education
Oklahoma State University
Stillwater, Oklahoma

Lloyd D. Briggs
Assistant Professor, Department of Technical Education
Oklahoma State University
Stillwater, Oklahoma

October 1969

ERIC **Clearinghouse**

The Center for Research and Leadership Development in Vocational and Technical Education
The Ohio State University
1900 Kenny Road
Columbus, Ohio 43210

U.S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

Office of Education
Bureau of Research

This publication was prepared pursuant to a grant with the Office of Education, U.S. Department of Health, Education and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their judgment in professional and technical matters. Points of view or opinions do not, therefore, necessarily represent official Office of Education position or policy.

PREFACE

This *Review and Synthesis of Research in Technical Education* is one of a series of "state of the art" papers in vocational and technical education related fields. It should assist in identifying substantive problems and methodological approaches for researchers and as well as providing practitioners with a summary of research findings which have application to educational programs. In the field of vocational and technical education, the pace of research and development activities has increased considerably during the period under review. Gaps which exist for some readers are probably the result of the author's prerogative to be selective.

As one of a series of information analysis papers released by the ERIC Clearinghouse on Vocational and Technical Education, this review is intended to provide researchers, curriculum development specialists, and practitioners with an authoritative analysis of the literature in the field. Those who wish to examine primary sources of information should utilize the bibliography. Where ERIC Document numbers and ERIC Document Reproduction Service prices are cited, the documents are available in microfiche and hardcopy forms.

The profession is indebted to Donald S. Phillips and Lloyd D. Briggs for their scholarship in the preparation of this report. Recognition is also due Arthur H. Nelson, President, Technical Education Research Center and Edwin L. Kurth, Associate Professor, University of Florida, for their critical review of the manuscript prior to its final revision and publication. Joel Magisos, information specialist at The Center, coordinated the publication's development.

Members of the profession are invited to offer suggestions for the improvement of the review and synthesis series and to suggest specific topics or problems for future reviews.

Robert E. Taylor
Director
The Center for Vocational and
Technical Education

INTRODUCTION

This publication reports some of the major contributions that have been made in the field of technical education since Milton Larson's *Review and Synthesis of Research in Technical Education* published in August, 1966. In some instances, articles published prior to 1966, which were judged to be significant for showing trends or for making comparisons, are included.

The review is intended to serve both practitioners and researchers in the field. Practitioners should find this publication useful as an aid for identifying materials and sources of materials applicable to operational situations. For researchers, the review provides an overview of research in the field which should be helpful in appraising the current status of research, in identifying trends, and in planning additional research. The review should also facilitate literature reviews relative to specific topics. To accomplish these objectives, an effort has been made to include significant research findings resulting from studies made during the period covered by the review. In addition, some materials not strictly of a research nature which serve to identify problems or make suggestions for research have been included. It is hoped that this information will serve as a "benchmark" upon which future work and progress can be structured.

Materials reviewed were obtained from several sources. The majority, however, were obtained from the Educational Resources Information Center (ERIC). This system greatly simplified the task of identifying and securing materials to be reviewed.

Many of the problems in technical education are common to other areas of education, and research completed in these areas has implications for technical education. Because of the necessity to impose limitations, this review treats only those materials specifically related to technical education. A number of studies, however, with titles denoting other areas were found to contain information pertinent to technical education.

A topical outline was used to provide a framework for reporting the review. As always, some problems of classifying studies according to the outline were encountered. Several studies contain information relative to more than one of the selected topics. In some cases, particular studies are cited more than once.

The reviewers express their sincere appreciation to all persons who have made contributions to this review. Special thanks and gratitude are expressed to David A. Anderson for his assistance in locating materials for the review.

Donald S. Phillips
Lloyd D. Briggs

TABLE OF CONTENTS

	Page
PHILOSOPHY	3
MANPOWER NEEDS	4
EDUCATIONAL PROGRAMS	5
CURRICULUM	7
STUDENT PERSONNEL SERVICES	14
EVALUATION	16
ADMINISTRATION AND SUPERVISION	18
TEACHER EDUCATION	21
LEARNING PROCESSES AND TEACHING METHODS	22
INSTRUCTIONAL MATERIALS AND DEVICES	24
FACILITIES	25
RESEARCH	26
SUMMARY AND CONCLUSIONS	29
BIBLIOGRAPHY	32

REVIEW AND SYNTHESIS OF RESEARCH IN TECHNICAL EDUCATION

Second Edition

PHILOSOPHY

Technical education, born in private schools outside the educational mainstream, has only recently become recognized as a significant and important function of public education. From its early introduction in this country until recent years, the primary responsibility for technical education has been assumed by private schools. As the demand for technical workers has increased, however, public educational institutions have begun to play an important role in preparing technicians. Federal legislation which has provided funds for the support of technical education has served to influence the growth of these programs in the public sector.

If technical education rightly deserves a place in the educational mainstream, it is important that serious attention be given to developing a viable philosophical framework for this area of education.

Philosophical Considerations

The Advisory Council on Vocational Education (1968) found an existing tendency to classify education as "general" or "vocational." While the council contends that the distinction is false, it still poses a major concern for both vocational and technical education. Ray (1968) reviewed the literature relative to social and philosophical considerations of vocational education. In assessing the future prospects of vocational education, the reviewer contends that the justifications for vocational education as a legitimate part of the educational mainstream are social, psychological, and cultural. Today, however, vocational education is more responsive to political and economic considerations than to philosophical positions. While these contentions are made about vocational education, many of the same considerations apply to technical education. Broudy (1966) suggests that the traditional claims for the role of vocational education should be re-examined in view of the many changes that are occurring in today's society. The arguments set forth by Broudy have important implications for technical education.

Identification and Definition

The first educational programs designed to prepare persons for employment in technical-level occupations were developed in the field of engineering. Consequently, there has been a tendency to view technical education as a type of education. In his brief treatment of the development of technical education, Venn (1964) points out that, as technical-level occupations in other fields have been identified and educational programs has been developed, it has become necessary to assign new meanings to the term technical education. Today technical education is viewed as a level of education. Today technical education is viewed as a level of education rather than as a type of education. Evidence of the broadening concept is found by comparing the publication, *Criteria for Technician Education* by Brooking and Ducat (1968) which considers planning and development of programs in several areas with a similar publication by the Department of

Health, Education and Welfare (1962) which treats technical programs in the industrial and engineering areas.

MANPOWER NEEDS

Accurate assessment of existing technical manpower requirements and projections of future requirements are useful to educators for educational planning and to students, parents, and counselors for career planning. Studies of technical manpower needs at state and national levels and in several fields of technology are reported in the literature. Kaufman and Brown (1968) have reviewed the literature relative to manpower supply and demand. These reviewers caution that a manpower forecast is seldom more than a sophisticated and knowledgeable guess about the future, and should be treated as an approximate guideline.

National Studies

A study of technician manpower requirements and resources is reported by Rosenthal (1966). Based on an analysis of data compiled in 1963, several projections of technician manpower requirements were made. For each projection a specific set of assumptions regarding economic conditions, unemployment rates, and trends in the utilization of technicians was employed. Alden (1966) studied the demand for engineers and technicians. In this study it was found that the increased offerings of technical programs by junior colleges was increasing both the supply of an the demand for technicians. The shortage of engineers is also increasing the demand for technicians. During a one-year period, the number of technicians per 100 engineers increased from 38 to 42.

Manpower requirements in the health service industry have been studied by Sturm (1967). In this publication, several factors which will influence manpower requirements are considered. Manpower projections by occupation group are made for the years 1965, 1970, and 1975. A conference devoted to manpower in the medical laboratory field is summarized in a Department of Health, Education and Welfare Document (1967). Forces that are changing manpower requirements and utilization in the medical laboratory field were considered at this conference. Recommendations for research relative to manpower needs and knowledge and skill requirements were made by the conference participants.

Studies designed to identify technical manpower needs in emerging occupations are reported by Roney (1966) and the Technical Education Research Center (1967). Roney reports the results of a nationwide study of the demand for electromechanical technicians. This two-phase study sought to determine needs, to identify knowledge and skills required of successful technicians, and to use this information for proposing a two-year curriculum. A similar study in the field of bio-medical equipment technology was conducted by the Technical Education Research Center. These studies employed different techniques for identifying data sources. Roney used a panel of consultants to suggest information sources while the Technical

Education Research Center used sampling techniques for selecting respondents.

State Studies

Studies of technician manpower needs have been made in several states. In some cases the studies have dealt with the total spectrum of technician manpower. Examples of this type of study are those by McComas and Willey (1966) and Corplan Associates (1966b). Other studies have dealt with a single technology or occupational area. Studies of this type are reported by Hoover (1966), Teel and others (1966), Warmbrod (1966), Jacobson and Swanson (1966), and Weede (1966).

EDUCATIONAL PROGRAMS

Technical education has experienced an unprecedented growth during the last decade. Enrollments have increased substantially and there has been a significant increase in the number and kinds of technical education programs. Today technical education programs are provided by almost every type of educational institution—both public and private, and technical programs of some type are offered in each of the fifty states. A directory of institutions and programs in each state is included in the Technician Education Yearbook (1967).

Programs in Junior Colleges

Specific ways in which industry and junior colleges can cooperate to provide technical education programs are identified and discussed by Ryan (1967). A brief description of an associate degree program developed by industry and the junior colleges is given. Ryan contends that one of the major problems of both education and industry is to find methods and techniques for educating the less-gifted students.

Smith (1966) surveyed the technical education offerings in 208 junior colleges by means of a mailed questionnaire. From the questionnaire data it was found that the number of junior college technical programs had increased markedly during the ten-year period from 1956 to 1966. Based on the information relative to future plans of these institutions, Smith concluded that the expansion in technical education offerings in junior colleges will continue for the next decade.

A listing of the occupational education offerings in Illinois junior colleges has been prepared by Grede (1968). Program offerings are grouped under five major headings: (a) Industrial and Engineering Technology, (b) Business, Secretarial, and Data Processing, (c) Health Occupations, (d) Public and Social Service, and (e) Other, which included Agriculture, Commercial Art, Home Management, Hotel Services, and Radio and Televison.

An overview of post-high school agriculture programs in the United States has been prepared by Hensel (1967a). Material for the publication was obtained from 60 institutions, located in 20 states, which offered one and

two-year programs. Descriptions of programs in the areas of agricultural mechanics, agricultural business, plant and soil sciences, animal science, forestry and conservation, and production agriculture are given.

Information for planning curricula in dental assisting has been prepared by the California State Department of Education (1966). The purpose of this study was to compile and analyze data for constructing a model dental assisting program. Recommendations in the report are based on information from 22 programs in California junior colleges.

A conference devoted to the identification and discussion of articulation problems between high schools and two-year colleges is summarized by Brick (1967). The main thrust of this conference was directed toward programs on business, mechanical, and electrical technology. Papers dealing with several facets of articulation were presented and analyzed, and recommendations for research relative to articulation were reported.

Programs in Colleges and Universities

Technical education programs are generally considered to be the responsibility of junior colleges, area vocational schools, and technical institutes. A number of technical programs, however, are offered by four-year colleges and universities. The status of less-than-baccalaureate level technical education programs offered by colleges and universities is reported by Martin[1]. Data were collected from 282 institutions throughout the United States by means of a mailed questionnaire. Forty percent of the responding institutions offered less-than-baccalaureate level technical programs. Institutions with enrollments of 10,000 or more tended to offer more technical programs than did institutions with enrollments of less than 10,000. Plans to expand their technical program offerings were reported by approximately half of the responding institutions.

In addition to the growth of two-year technical programs, there has been considerable growth and development in baccalaureate level technology programs. DeFore (1967) and Foecke (1967) give a comprehensive treatment of the growth and development of four-year programs. Enrollments in four-year technology programs for the fall of 1967 are reported by Alden (1968).

Pre-Technical Programs

The term "pre-technical" has at least two meanings. One meaning refers to a type of program offered by a post-high school institution to help underprepared students meet entry requirements of technical programs. The term is also used to refer to high school programs designed to prepare persons for enrollment in post-high school technical programs.

A guide to assist administrators of post-high school institutions in planning pre-technical programs for under-prepared students has been prepared by Venn (1967). This document identified four groups of students who could profit by enrolling in such programs. Several important aspects of planning and developing pre-technical programs are identified and discussed.

[1]The publication is not dated, but it is stated in the body of the report that the data were collected in 1967.

An innovative high school pre-technology program is described by Smith (1966). This program was designed to orient "capable average" learners toward semi-professional programs in junior colleges and technical institutes and to the job of engineering technicians at various levels. A description of the curriculum development process and samples of curriculum and instructional materials are included in the report.

High school pre-technical programs in business, engineering, and medical technology have been developed by the New York City Board of Education (1967). The purpose of these programs is to provide opportunities to motivate selected high school students to continue their studies in community colleges and in higher institutions of learning.

CURRICULUM

Planning and development in technical education involves special considerations not generally in other areas of education. It is relatively clear that much is yet unknown about curriculum content requirements for meeting a technician's long-term career needs and his needs for living in, and contributing to, his society. This is evidenced by the considerable interest and effort which technical educators are devoting to research in this area.

Curriculum Planning and Development

Several studies in the area of curriculum planning and development have resulted in a number of monographs and research reports which should prove beneficial to technical educators and administrators.

The State of Washington, in developing a state vocational instruction system, has employed "occupational analysis" as a basis for developing their curricula. A paper by Wimer (1968) reporting on the "Research and Definition" phase of the project describes the system, the manner in which occupational analysis functions, and how it relates to their curriculum development. The project is still in process so no definitive conclusions have been drawn; however, information about occupational analysis and its significance for curriculum development should be helpful to others who are contemplating such projects.

Ryan (1968) reported on a summer institute to prepare vocational educators in curriculum development. The program treated the areas of curriculum process, implementing an organic curriculum concept, and the behaviorial definition of objectives in a systems approach to curriculum development. Participants of the institute worked as task groups in using a "decision model of curriculum development" to produce a guide for curriculum development in vocational education. The report includes this guide plus papers presented at the institute.

A study to determine the content most appropriate for preparing technicians in each of six technical occupations areas of manufacturing was conducted by Schill and Arnold (1965). The purpose of this project was to study the feasibility of minimizing extraneous and repetitious curriculum content by developing technical courses and training programs which are

complementary rather than redundant. This study identifies the competencies and the content which are common to the following technologies: electronics, electro-mechanical, mechanical, chemical-mechanical, chemical, and electro-chemical. Though the research described in this report was specific in the six technologies studies, the methods and research procedures employed may be applicable to similar studies in other areas.

A publication by Brooking and Ducat (1968) identifies occupational criteria and preparatory curriculum patterns for developing technical education programs. The authors used a reference base of five general abilities for determing technician occupational requirements which can be translated into educational program content. With these five underlying general abilities as universal requirements, twelve general activities were identified which the authors feel every technician must be prepared to perfrom. The manual was written as a guide for admininstrators who wish to establish technical education programs but are not familiar with them.

In a study by Arnold (1965), management personnel and technicians were asked to identify cores of subject matter related to technician job performance. The author then attempted to differentiate between their judgments. The study focused upon the development of a structure which would permit assessment of differences and relationships between the currciular recommendations of management and of technicians. The author found that a surprising number of technician jobs seemed to be hybrids which required knowledge of two or more technical areas. He found also that although technicians and management differed in age, educational attainment and salary, their views toward 2-year technical curricula were essentially the same. The report includes core recommendations representing the collective views of management and technicians and suggests that these be used as guidelines in the design and refinement of post-high school technical programs.

Engineering and Science Technologies

Several studies have been made of curricula and curricula needs in technologies related to fields of engineering. Mills and Rahmlow (1966) identified specific items of knowledge and clusters of knowledge required in major types of work commonly done by electronic technicians. Principle job tasks of technicians were classified into various categories. Questionnaires, with special information topics in each category, were then administered to workers in jobs representative of the national pattern of electronic technician occupations. Special knowledges reported to be necessary for performing job tasks were grouped to assist schools in planning educational curriculums and programs.

Dobrovolny (1967) outlined a two-year electronic technology program which was adapted from a four-semester to a six-quarter sequence. He described the philosophy and objectives of the program and listed the desirable characteristics of the faculty and students. The report includes the curriculum as well as course outlines for the total program. In addition, suggestions for the laboratory, its equipment and reference materials, and other pertinent program planning information is included.

A study to ascertain the degree to which post-high school technical electronic programs were meeting industry's needs was conducted by Vasek (1967). A checklist of numerous instructional topics was sent to electronics teachers to determine the extent to which the topics were being treated in their classes. The list was also sent to various industrial firms and governmental agencies for their reaction as to the relative importance of the topics in an electronic technician's educational program. An analysis of the data revealed the electronics teachers placed significantly more emphasis on basic content than industrial personnel indicated was necessary. The author indicates that the findings should provide a sound basis for adjustments in electronic curriculums and should result in up-dated programs attuned to industrial needs.

Federal and state agencies and educational institutions have been active in developing curriculum guides for various areas of technology. Brooking and others (1966) developed and published a curriculum guide for electronics technology. The guide was designed to assist school administrators, supervisors, department heads, instructors, and advisory committees who will be planning and developing new programs or evaluating existing programs in electronic technology.

A curriculum guide for instrumentation and automatic control was prepared by Weinstein (1966). The purpose of the guide is to help states organize and operate educational programs for occupations in the field of instrumentation.

The Office of Manpower Policy (1966) made a study of design and drafting processes to emphasize technological and manpower changes which may occur in the future. The study attempted to identifiy major technological changes which would occur in the following 10 years, to determine the extent and rate of their diffusion, and to assess their effects. Based on information gained in the study, the authors predicted several changes in design and drafting processes which may affect curricula for technical education programs in this field.

A study group from the American Institute of Architects believes that many existing 2-year architectural technology programs are inadequate. Ternstrom (1966) reported that this group placed most of the architectural technology programs which it studied in one of two general categories— (a) drafting programs which lacked breadth and failed to provide background in mathematics, applied science, and modern building techniques, or (b) programs similar to the first two years of orthodox professional offerings with inadequate technical emphasis and little preparation for immediate employment. Several characteristics of architectural technology, including the recommended curriculum, are treated in the report.

Brame (1967) conducted a study in the field of Building Construction Technology. The purposes of his study were to ascertain certain knowleges and skills required for entry into technical occupations in building construction and to determine whether or not there existed a definitive body of knowledge and skills common to several positions at the technical level. This study was conducted in a localized area but the methods employed may

be useful in other geographical areas or in other technical fields of specialization.

A curriculum guide for a two-year program to develop highway and structural technology specialists has been prepared under the direction of Beaumont and others (1966). The guide was designed to assist technical educators and administrators who will be planning and developing new programs or evaluating existing programs in highway or structural technology.

Knoebel and others (1968) directed the preparation of a curriculum guide for a two-year program in metallurgical technology. This guide grew out of the emerging needs for producing purer and more complex metal and alloy products to meet the needs of space exploration, deep sea research, supersonic aircraft, and other devices subject to extremes of temperature, stress, and corrosion.

A conference on chemical technology curriculum development and student recruitment was summarized in a report by Brooking and Chapman (1967). Conference activities focused on three major topics—(a) the technician in college, (b) the technician in industry, and (c) the college-industry interface. The report includes complete copies of papers presented at the conference.

Problems confronted by planners of nuclear technology programs were discussed by Kover (1967). The author briefly describes a training program for nuclear technicians and points out types of employment which graduates of such programs can expect.

The significance of mathematics and science in technical education programs has long been a concern of technical educators. Laws (1966) made a study of mathematical expectations of technicians in Michigan industries. Objectives of the study were to identify the fundamentals of mathematics and common mathematic skills needed by technicians and to determine if these fundamentals and skills should be included in the educational curriculum or taught as related activities after employment. Industry's responses to this inquiry and the authors recommendations for implementation of the findings are included in the report.

Miller (1968) edited the proceedings of a consultants' workshop on technologies related to mechanical engineering. The purpose of the workshop was to identify qualified consultants who could assist in the development of mechanical engineering technology programs. The publication is intended as a guide to consultants engaged in such activities and as an introduction to mechanical technology for technical education administrators who are formulating programs in this field.

Business Technology

Technical education was orginally thought to be concerned with only those occupations which were directly related to engineering and science. Recent trends, however, have been to consider it more as a "level" of education and include other areas of sub-professional occupational preparation which generally require two or more years of rigorous college work.

A planning guide developed by McIntosh (1968), though concerned primarily with facilities planning, includes information on the instruction program for data processing technology. The sections on program features, educational objectives, and program content should be useful to those developing such programs.

A guide for developing curricula to prepare technicians for the computer and business machines industries was developed by Lescarbeau and others (1968a). The guide represents the consensus of opinion of the Technical Education Consortium based upon the advice of industrial experts in this field. Designed for schools which plan to initiate such programs, the guide includes course outlines, lists of audio-visual materials, sample laboratory experiments and examinations, and a list of equipment suggested for the laboratories.

The North Carolina State Board of Education (1966a) has developed a curriculum for court reporting. The curriculum, which was designed for use in technical institutes and community colleges, was developed by a curriculum committee at the state level and revised to incorporate teachers' suggestions. Another curriculum has been developed by the North Carolina Board of Education (1966b) for preparing traffic and transportation specialists. The curriculum is designed to provide training in new techniques and understanding of the latest state and federal regulations applicable to traffic and transportation.

Bishop and Sheebe (1968) prepared a publication on the role of the community college in developing traffic specialists and technicians. The booklet describes traffic technicians by explaining what they are and what they do. It lists major areas in which traffic problems exist today and discusses their implications for curriculum content in programs to train traffic technicians.

Another area of business technology is supermarket management. Haynes (1968) prepared a manual of guidelines for a 2-year Associate-Degree program in this area. Based on a study of manpower needs, the author has developed a set of competencies strategic to success at the mid-management level. The curriculum for supermarket management encompasses four curricular areas: (a) technical or specialized, (b) marketing and economics, (c) general business, and (d) general education.

Agricultural Technology

The field of agriculture has been experiencing many of the same technological changes which have brought about the needs for technician support in other areas. Though this trend has developed more slowly in agriculture than in some other areas, there can be little doubt that agricultural technology will expand rapidly in the future.

Halterman and others (1965) prepared a curriculum guide for Agricultural Chemicals Technology. The guide is based on data from studies of off-farm agricultural occupations in several states and includes course descriptions and course outlines for each course.

A national seminar on preparing agricultural technicians is described in a report by Taylor (1964). The report includes all of the papers presented at the seminar including the summaries of the panel discussions and activities of the task force.

Clark (1968) compiled a curriculum guide for a 2-year technical program to develop specialists for the grain, feed, seed, and farm supply industry. In addition to other program material, the guide lists the curriculum with course descriptions and course outlines.

Forest technology is developing with considerable rapidity. A curriculum guide for forest technology was developed by the University of New Hampshire (1968). The guide was prepared to assist states and other interested organizations and institutions in planning and developing programs to meet the nation's increasing need for qualified forest technicians.

The American Vocational Association (1965) has compiled a document of material for developing training programs in production agriculture and off-farm agricultural occupations. The document lists objectives for vocational and technical agricultural programs and describes the development of these objectives for agricultural education.

Health Technology

One of the faster growing segments of technical education has been that of health technology and it appears that the trend toward expansion is gaining in momentum. The Technical Education Research Center (1967) has contributed to the research in this field with a project and subsequent report concerning the development and evaluation of educational programs in Bio-medical Equipment Technology. The purpose of this multi-phase project is to assist educators and schools throughout the country in establishing such technology programs with a minimum of time, cost, and effort. In this report on Phase I of the project, the author discusses such curcirulum related topics as curriculum guidelines, special curriculum requirements, and curriculum development. The report also includes a preliminary curriculum chart for those who are interested in the program content.

The U.S. Office of Education (1966) published a suggested guide for a program to prepare medical laboratory assistants. Information is given to assist in organizing and administering a training program in a variety of settings and to provide guidance in establishing new programs and evaluating existing ones.

A project to develop a "model" health occupations training program by job analysis was reported by Kishkunas (1967a). The report lists tasks of nurse aides, practical nurses, and surgical technicians. The researchers concluded that the project was successful and that their model is suitable as a basic design for other para-medical training programs. Appendixes to this report were listed in a separate publication by Kishkunas (1967b). Among the appendixes are a schematic representation of curriculum development and a technical behavior checklist which may be beneficial to others who are planning such programs.

Fullerton and others (1966) studied the integration of paramedical education through consolidation of related training as a first step in designing curricula to meet the changing requirements of medical care occupations. In a report of the project the authors list courses common to existing paramedical programs, the nature of such commonalities, and guidelines for the integration of these programs.

Another study on technicians for health related fields was described by Kinsinger and Ratner (1966). This report, covering Phase I of a multiphase program, consists of curriculum guidelines and recommendations for teacher training. Objectives and required knowledge, understanding, and skills are described for technical education in a number of various occupations in medical technology.

A report by Marshall and Hunt (1968) describes a radiation health technology program at the lower division college level. In addition to other aspects of program planning, the report discusses special characteristics of the curriculum and lists course descriptions and course outlines.

The North Carolina State Board of Education (1967) has developed a dental hygiene guide for administrator and teacher use in developing dental hygiene curricula in technical institutes and community colleges. The manual includes among other items, a suggested curriculum and teaching references.

Other Technologies

Several studies and curriculum guides were available in less common areas of study so they were grouped in this category.

A curriculum guide prepared under the direction of Knoebel and others (1967) has been developed to train specialists for the food processing industry. The guide was prepared to aid states in planning and developing programs to meet the Nation's increasing need for skilled technicians in the food processing industry.

Another area which is drawing considerable interest today is that of marine technology. Chan (1968) prepared a report which is intended to serve as a source-book and to provide information, guidelines, and recommendations for developing programs in marine technology. The data presented are taken from a California study but some statistical projections are made for the United States as a whole.

Emerging Technologies

Considerable interest is devoted today to the so-called "emerging technologies." These involve occupational fields for which few, if any, educational programs have been available in the past. Many, however, are not necessarily new occupations. Industries have merely recruited technicians who were trained in other (related) specialized areas and re-trained them or re-oriented them to the job at hand. Electro-mechanical Technology is a good example of this type of situation.

Roney (1966) reports on a field study of electro-mechanical technology to identify occupational and educational needs in this area. Data from the

study were used to prepare a basic curriculum plan for a 2-year post-high school program in electromechanical technology. The curriculum appears in his report.

A curriculum guide for Electro-Mechanical Technology which is oriented specifically to the computer and business machines field was developed by Lescarbeau (1968b). The guide includes the suggested 4-semester curriculum and content outlines for each course.

Dobrovolny and others (1968) reported on a project for training specialists in horological and micro-precision work. The report includes a rationale for the program and the suggested curriculum.

STUDENT PERSONNEL SERVICES

A number of studies relative to several aspects of student personnel services are reported in the literature. Bottoms (1966) studied the needs for student personnel services in Georgia's area vocational-technical schools and the extent to which the needs were being met. The objective of this study was to develop a program of student personnel services based on the needs of the institutions involved. For purposes of the study, recruitment, admission, personnel records, orientation, information, counseling, placement, and follow-up were considered to be facets of a student personnel services program.

Guidance

The literature relative to career development for the period of 1962-1968 has been reviewed by Tennyson (1968). In the review summary, optimism is expressed concerning the beginning which has been made toward establishing or contradicting, by empirical means, the fundamental assumptions on which the theory of vocational development rests.

In assessing the current status of vocational guidance, the Advisory Council on Vocational Education (1968) found that vocational guidance service was available in only half of the nation's high schools and that, in most cases, the services were inadequate. While the number of counselors has increased substantially in recent years, there is no evidence to show that there has been an increase in vocational guidance for the occupationally oriented student.

Phillips (1968) found that less than one-third of the freshman students enrolled in post-high school technical programs in four Oklahoma institutions had visited with a counselor while in high school. Approximately one-fourth of the students had attended high schools which did not have counselors.

Findings of the Specialty Oriented Student Research Program, a longitudinal study initiated in 1962, are reviewed by Hoyt (1968). This program is designed to collect, analyze, and disseminate research data holding potential for helping high school counselors better serve students planning to attend post-high school occupational education programs.

Brogley (1967) found that high school seniors were reluctant to admit befor their peers that they planned to attend post-high school trade, technical, or business schools.

Students seeking information about post-high school technical programs often find that available information is general in nature and has limited value for making specific decisions. Hoyt and Cochran (1965) describe a system for providing specific information about post-high school trade, technical, and business programs to prospective students. Hopfengardner (1967) has prepared a notebook for use by counselors which provides information about post-high school technical programs in Ohio.

Workshops and institutes have been devoted to numerous aspects of vocational guidance. Wellman (1966) compiled a series of papers developed by the participants at a 1966 summer institute. These papers emphasizing the economic, sociological, psychological, and administrative variables which influence vocational decision making and career development, were prepared as a resource for vocational guidance personnel. The Oklahoma State Department of Education (1968) has published a guide for assisting in the development of vocational guidance programs in grades K-12. Materials for this guide were developed by a group of workshop participants and consultants.

Student Characteristics

In his discussion of technical students, Graney (1964) states: "there are surprisingly few factual data which define the kinds of individuals such students are." He goes on to say that there is much speculation about technical students; but, "the speculation deals less with the subject of what technical students are than with what they ought to be." Some five years later there still appears to be some validity to Graney's statements.

Miller (1966) and Van Hall (1967) give similar descriptions of technical students. These descriptions were based upon experience gained from working with and studying technical students in different geographical areas.

In the Specialty Oriented Student Research Program, Hoyt (1968) defined the "specialty oriented student" as:

> one whose motivations toward educational achievement are built largely around a desire to acquire a specific occupational skill or set of skills. Courses designed to broaden his potential for a vocational living have little or no appeal to this student. He may be described as expressing relatively more interest in being "trained" than in being "educated."

Findings during the first five years of the project lend some support to the validity of the definition.

Hakanson (1967) investigated the relationship between selected personal characteristics and educational attainment of students in occupation-centered curricula at six junior colleges. Findings from this study indicate that low and especially middle socioeconomic status students are more likely than high socioeconomic students to complete an occupation-centered curricula. Hakanson found that only 14 percent of the students withdrawing from college transfer programs enrolled in occupation-centered curricula during the period of the study. This finding is consistent with the information reported by Taylor and Hecker (1967). These investigators found that stu-

dents who are not successful in the program they select upon initial enrollment tend to withdraw from college rather than change to another curriculum. This was true despite the extensive range of alternative programs and counseling facilities that were available to students in the situation studied.

Prediction Studies

In several studies the relationship between selected variables and success in technical programs has been investigated. Turner and others (1966) found that socioeconomic status, high school grades, and standardized test scores could be used to predict grade point averages, to differentiate between students in various curricula, and to differentiate between graduates and non-graduates. Taylor and Hecker (1967) found that ability and high school achievement scores appear to be more useful than interest or interest related variables as differentiators between students at the associate degree level who either complete a program, change to an alternate program, or withdraw from college. Both Hoyt (1966) and Anderson (1966) found that high school grades and American College Test (ACT) scores could be used to predict grades of junior college technical students.

Moss (1966) investigated the effect of experiences in high school industrial arts upon success in post-high school technical programs. No differences in scholastic achievement that were attributable to differences in the amount of industrial arts experiences could be found.

EVALUATION

Evaluation of education programs, which is both important and complex, takes several forms and occurs at all levels of education. The need for a national review of vocational and technical education has been discussed by Barlow (1967) who argues that evaluation provides the basis for making changes to meet the needs of a dynamic society.

The 1963 Vocational Education Act requires that the national program of vocational and technical education be reviewed at intervals not to exceed five years. The first of the periodic reviews has been completed by the Advisory Council on Vocational Education (1968). Several recommendations for improving and expanding vocational and technical education services were made. Lack of a fully developed data collection and reporting system proved to be a major problem for the Council.

A review of the literature relative to program evaluation for the period of 1962-1968 is reported by Costner and Ihnen (1968). These reviewers indicate that a start toward more rigorous evaluation has been made, but a great deal remains to be done.

Follow-up Studies

Students' success in obtaining employment and progressing in the world of work has been one of the primary evaluation techniques used in vocational and technical education. The use of follow-up studies as an evaluation

technique has been studied by Sharp and Krasnegor (1966). Some 42 follow-up studies in vocational education were summarized and analyzed. While the use of follow-up studies as a technique for evaluation was recommended, it is argued that more attention should be devoted to explanatory studies. The most serious gap in follow-up information was found at the post-high school level for persons trained in technical institutes and junior colleges.

A few follow-up studies of post-high school technical students are reported in the literature. Most of these studies, however, are localized and of limited scope. Graduates of an electronics program in California were studied by Stephenson (1968). Mobility patterns of technical education graduates in the state of Oklahoma were studied by Bates (1968).

The Santa Cruz County Board of Education (1966) has prepared a manual for use in making follow-up surveys in vocational and technical education. This manual includes instruments and instructions for their administration.

Accreditation

Development of guidelines and criteria for accrediting technical programs has become increasingly important as enrollments in these programs have increased. The role of regional accrediting associations in evaluating and accrediting post-high school technical programs has been discussed by Davis (1966), Robb (1967), and Bartlett (1968). Some of the major issues relating to the accreditation of technical programs have been examined by Harris (1968). One common theme in these papers is the importance of general education in technical programs.

Wiegman (1969) has also called attention to the need for meaningful general education experiences in technical programs. While several persons have stressed the importance of general education for the well-being of technicians, relatively little research dealing with this topic is reported. Characteristics of outstanding technicians employed in Arizona industries were studied by Brown (1967). Data for this study were obtained from technicians and their employers. Prior to employment, most of those studied had completed either a two or a four-year post-high school program. One point of interest was the technicians' positive attitudes toward the importance of getting along with people and their negative attitudes about the importance of social studies in their background.

Policies affecting the acceptance of transfer credit for technical courses have been studied by the Auburn University (1966) and Purtzer (1967). Transfer policies of several institutions from a wide geographicial area were analyzed. Both studies concluded that there is no general pattern among institutions regarding transfer policies. Roney (1969) sees this as one of the major problems in technical education. He argues that higher education should provide a vertical structure for occupational education. In a similar vein, Park (1968) analyzes some of the factors which influence the development of technical curricula in junior colleges. He contends that innovations in junior college curricula are hampered by the importance that is placed on transfer programs.

Accreditation of two-year engineering technology programs has been a function of the Engineering Council for Professional Development (ECPD) since 1949. In recent years a number of four-year technology programs have been developed and accreditation of these programs has been considered by the ECPD. Hartung (1967) summarizes the committee reports relative to this issue and reports that the guidelines used for accrediting two-year programs will be used to accredit four-year technology programs.

Program Evaluation

A study of the impact of the 1963 Vocational Education Act on vocational-technical programs in Texas junior colleges is reported by Bass (1967). The objectives of this study were to determine the effect of the Act upon the number and kinds of vocational education programs offered in public junior colleges and to establish whether or not the federal funds distributed under the Act promoted the purposes of the Act.

A number of school districts and states have made studies to assess the status of vocational and technical education. Swanson (1966) reports a rather comprehensive study of vocational education in Missouri. A study of post-high school occupational education in Oklahoma is reported by Roney and Braden (1968). One portion of this study was devoted to an analysis of the cost benefits of post-high school education. The findings of this study are similar to those reported by Carrol and Ihnen (1966).

The use of program planning, budgeting, and evaluation systems in vocational education was the topic of a seminar attended by state and federal educators. Smith and Connolly (1967) summarized the seminar proceedings.

Evaluation is an important and difficult aspect of developmental and pilot educational programs. Bjorkquist (1968) used a follow-up study to evaluate and compare the effectiveness of a field-oriented and a job-oriented technical program. One of the major problems with this type of evaluation is the time element. Tuckman (1967) developed and tested an evaluation model which may facilitate evaluation of on-going programs. "The model," according to Tuckman, "provides a means of obtaining immediate information regarding the degree to which a pilot program realizes its stated objectives."

ADMINISTRATION AND SUPERVISION

Quality and effectiveness of technical education programs are the responsibility of administrators at three levels: local, state, and federal. At each level there are several factors which influence the design, development, and implementation of quality technical programs. Brookings and Ducat (1968) discuss some of the factors relating to effective administration of technical programs.

The organizational structure for administration and supervision of vocational and technical education at the national level was reviewed by the Advisory Council on Vocational Education (1968). A comprehensive study of state level agencies for the administration of vocational education in 41

states is reported by Lee (1967) and Swanson (1967). Information from 1,932 respondents including teachers, laymen, vocational educators, board members and legislators was collected by means of group and individual interviews. Findings from the study were used as a basis for the design and development of a prototype instrument to assist state agencies in analyzing their programs.

State and Local Studies

During the last six years a considerable number of studies have been made at the state and local levels. These studies have dealt with policies relating to organization, administration, finance, and facilities for vocational education. Lee and Hamlin (1968) report that during this period some 30 comprehensive state studies and a number of local studies were completed. These authors also report that 17 doctoral theses relating to organization and administration were completed during the period of 1962-1968.

Some state studies have been concerned with the total vocational and technical program at both the secondary and post-secondary level. An example of this type is reported by Bettina (1968). Regarding evaluation, it is recommended that program effectiveness be evaluated according to the percentage of trainees who work at the occupation for which they are trained, how well the trainees do in their respective jobs, and how well satisfied they are with the training they receive.

A statewide study of post-high school occupational education is reported by Roney and Braden (1968). These authors recommended that all post-high school occupational education services be coordinated through one administrative unit.

A survey dealing with engineering and technology in Arizona is reported by Lee (1968). In this study available educational services were compared to manpower needs in the state.

Studies to determine the feasibility of the establishment of area schools or community colleges for providing vocational and technical education have been made by a number of local areas. Examples of this type of study are those by: The Vocational-Technical Study Committee (1966), Pickett (1966), Kansas City School District (1967), and Brewin (1968).

Articulation between secondary and post-secondary technical programs in agriculture was considered by Bail and Hamilton (1967). It was concluded that a continuing dialogue between secondary and post-secondary personnel is necessary to achieve maximum benefits from the available educational resources.

Administrators

Critical shortages of trained leadership personnel have impeded the expansion and development of quality technical education programs. In his study of innovations resulting from technological change, Rogers (1966) reviewed the changing role of school administrators and concluded that increased complexity in school administration places a higher premium on

competent leadership. Stevenson (1966) assessed the needs for vocational education personnel above the local teacher level and found an extreme shortage of qualified leadership personnel.

Schaefer (1966) summarizes a symposium relative to the development of advanced degree programs to prepare vocational-technical education personnel. Green (1966) summarizes two leadership development seminars for federal, state, and local educators with responsibility for vocational technical education.

One of the more analytical studies of vocational-technical leadership is reported by Wenrich and others (1968). The objectives of this study were: (a) to measure leadership behaviors exhibited by members of an experimental group and a control group, and (b) to develop an objective formula for the selection of men who would probably show the most effective leadership behavior in future years. The study followed up the graduates of training programs from the school years 1964-65, 1965-66, and 1966-67.

Doctoral dissertations by Fielding (1966) and Whitney (1967) dealt with the role and qualifications of vocational and technical administration in junior colleges.

A number of leadership institutes for technical education personnel were coordinated by the Ohio State University in 1966 and 1967. Reports of presentations and materials from these institutes have been compiled by Cotrell and Valentine (1967) and Miller and others (1968).

Planning Guides

Growth and expansion in the number and kinds of technical programs has created a number of planning and administrative problems. Several individuals and agencies have given attention to specific problems associated with planning and implementing technical education programs.

Guidelines for the use of advisory committees have been prepared by Riendeau (1967). This publication lists three types of advisory committees and discusses the purposes and functions of each. The publication also treats the role of junior colleges in providing occupational education.

An overview of technicians in the health services has been prepared by Kinsinger (1966). In this publication health service technicians are defined and several occupations which require technical education are discussed. Problems of standards and licensing and their effect upon program planning are also considered. A guide designed to assist in the planning and development of health technology programs has been prepared by Kahler and others (1967). Several items which require administrative consideration are identified and discussed. A rather thorough treatment of problems relating to the establishment of associate degree nursing programs is reported by Rihm (1967).

The Iowa State Department of Public Instruction (1966) published a guide to assist with the development of merged districts for area vocational-technical schools and area community colleges. This publication gives attention to philosophical considerations and to organizational structures.

Data from 44 institutions were used as the basis for developing program guidelines for training agricultural technicians. Clary and Woodin (1965)

used a jury of experts to assist in refining and evaluating the guidelines. Fourteen factors which affect the planning and development of agricultural technician programs are discussed.

TEACHER EDUCATION

Growth in the numbers and kinds of technical programs and increased student enrollments has created a demand for several thousand new technical teachers. As this field has grown, so has the need for research in technical teacher education. It appears, however, that the amount of research and development in this area is very limited. Recognizing this, Miller (1967a) has developed a model to assist in the design and implementation of research in technical teacher education. Several of the major dimensions of this problem are identified and research strategies are proposed. The literature review treats several important publications dealing with technical teacher education.

A similar publication, but one which is somewhat broader, was prepared by Moss (1967). Materials relative to the total field of vocational-technical education are reviewed. Also included are some materials from the general field of teacher education. One important contribution of this review is the model developed for use in classifying studies that have been done, for showing interrelationships among them, for uncovering gaps in our knowledge, and thus for research planning.

Proceedings of a two-week summer institute devoted to looking at some of the critical problems of vocational-technical teacher education in small colleges are reported by Bell (1967). Papers dealing with several important issues were presented by consultants.

Arnold and others (1967) have prepared guidelines for the development of baccalaureate degree technical teacher education programs. These guidelines resulted from a summer institute devoted to exploring methods of improving technical teacher education.

A summer institute aimed at improving vocational-technical teacher education programs in the southern states is reported by Allen and others (1966). Fourteen teacher educators from the southern states attended an institute at the University of California at Los Angeles. The participants were provided opportunities to interact with 500 trade and technical teachers from California who were enrolled in summer school. Through this active participation, it was expected that the teacher educators would gain concepts and methods which could be employed in their institutions.

A study to ascertain the need for vocational and technical teachers at both the high school and post-high school level was conducted by Hensel (1967b). Data were collected by a questionnaire mailed to the state director of vocational education in each state. Forty-eight states responded to the request for information. Findings indicated that the need for post-high school technical teachers would increase by approximately 40 percent between 1965 and 1968.

Recruiting qualified teachers is a major factor in the implementation of educational programs in new technologies. Baysinger (1966) reports on seven summer institutes which were conducted at five institutions to prepare teachers for fluid power technology. At each institute the participants were divided into teams with each team assigned the responsibility for developing a fluid power curriculum. The procedures and techniques developed in these summer institutes have been documented as an aid to others who are concerned with preparing teachers for emerging technologies.

Schnelle (1967) conducted a study to evaluate the effectiveness of an eight-week summer institute to train instrumentation technology teachers. The institute was conducted at the State University of New York Agricultural Technical College at Morrisville, New York, during the summer of 1966. The evaluation of the program was conducted by two committees; a Regional Visitation Committee composed of four men knowledgeable in instrumentation and a Central Evaluation Committee composed of educators and industrialists. These committees concluded that the program was successful and outstanding, particularly in the areas of facilities, dedication of staff, and the technical content presented. Two deficiencies were noted: (a) the heterogeneous background of the participants and (b) the lack of presentations on teaching techniques and methodology.

Enlisted men separating from the military as a potential source of vocational and technical teachers has been investigated by Hensel (1967c). Information about their interests in teaching, educational background, occupational experiences, and personal factors were obtained from 1,152 enlisted men separating from military service during June or July 1966. The investigator concluded that approximately 9 percent of this sample could be classified as outstanding teacher prospects for vocational and technical programs.

One of the most comprehensive studies relative to trade and technical teachers is reported by Barlow and Reinhart (1968) who analyzed the characteristics of trade and technical teachers in California. Data were obtained from 185 teachers by group interviews and from 408 teachers by questionnaires. A substantial amount of information relative to teacher characteristics is reported in this study.

Professional competency of technical education teachers as a function of several educational background variables was studied by Kurth and Gianini (1967). Subjects for this study were 108 technical education teachers in Florida junior colleges. Several correlations between professional competence and background variables were computed and tested for statistical significance.

LEARNING PROCESSES AND TEACHING METHODS

The major function of education in America is to provide opportunities for learning and to guide the learning experiences of those served by education. Closely related to learning, and significantly important in education,

is the teaching function and the means or methods by which it is effected. Though learning processes and teaching methods comprise the nucleus of activity in technical education, surprisingly little research has been conducted in these areas. Some studies, however, which seem rather significant and which should prove beneficial to technical educators are reported.

A report by Allen *et al.* (1968) explains a teaching system which is designed to stimulate polysensory learning by the use of multi-media instructional materials. This system uses as many of the physical senses as practical to augment traditional instruction. The system, which is based on three separate levels of instruction, specifies particular skills and knowledge which are required for minimal expected achievements of individual students. The first level (recognition) is concerned with developing the student's ability to follow directions. The second level (recall) provides instruction based on the student's memory or knowledge of material which has been learned previously. Instruction at this level is aimed at developing the student's ability for translating verbal mathematical concepts and principles into symbolic statements, and vice versa. Level three (reorganization) develops the student's ability to recognize common factors in different situations and to bring various sources and types of information to bear on problem solutions for new applications. At this level, knowledge and skills are learned in the breadth and depth necessary to enable the student to transfer earlier learnings to new sets of circumstances and to apply principles, concepts, and theories to different but specific situations. The report presents details of the system, examples of its use, methods of preparing materials, criteria for evaluating its results, and suggestions for its future possibilities.

Mitzel and Brandon (1966) describe an on-going project in "computer-assisted instruction" (CAI). This form of instruction utulizes prepared material administered under computer control. The student receives instruction by slides, taped messages, and typed information, all of which are prepared by experienced teachers. The objectives of this study are to compare CAI with other educational strategies, to prepare appropriate instructional materials, and to prepare teaching personnel for using the system. This report contains considerable information about this type of instruction, however, the project is still in progress so no conclusions as to whether CAI does or does not, in fact, provide more efficient methods of teaching have been drawn.

Programmed instruction has increased in popularity in recent years and many educators are developing considerably interest in it. Norton (1967) reported on the selection and use of programmed materials in several different technologies. This report includes case studies from schools and industries which are successfully using programmed instruction in occupational education. The report also lists, and documents, several proven applications of programmed instruction.

Householder (1968) reviewed the literature relative to techniques and modes of instruction in vocational, technical, and practical arts education. Most of the material reviewed was more directly related to vocational and practical arts education than to technical education.

A review of research on teaching methods was made by Johnson (1965). The purpose of the review was to provide a basis for possible revision and up-dating of college courses on teaching methods. The report covers such areas as definitions of instruction and teaching, the teacher, problem solving, and creativity.

INSTRUCTIONAL MATERIALS AND DEVICES

A well-structured program with well-planned and well-organized instructional materials and teaching aids is one of the keys to success in technical education. While considerable effort has been devoted to developing and testing various types of instructional materials and devices, little information relative to their availability has been published. A search was made for up-to-date listings of instructional materials such as laboratory manuals, films, slides, filmstrips, textbooks, references, technical manuals from industry, etc., but few were found. An electronics curriculum guide by Brooking and others (1966), however, does list several sources of instructional materials and aids for electronics instructors. Other curriculum guides published by the U.S. Office of Education also list similar sources of instructional materials for their respective fields of technology. These guides include detailed course outlines for each of the courses included in the curriculum which should prove helpful to institutions beginning new programs or modifying old ones.

The New York City Board of Education (1967) has developed a manual to assist teachers, supervisors, and administrators in operating a pre-technical program in medical technology. The program was designed to motivate underachieving high school students and to prepare them for entry into medical technology programs in community colleges. Program aims, student selection, organization and administration, student evaluation, guidance procedures, and the teacher's role in such a program are discussed in the manual.

Mississippi State University (1965) published a guide for developing post-high school drafting and design programs. The guide which includes detailed course outlines and suggested student activities was developed by the state's junior college drafting teachers.

Baldwin (1966) assembled a director of associations, societies, and organizations which provides a variety of resource materials for use in technical education programs. Groups and organizations which have an interest in vocational-technical education are listed in the directory. Also included are lists of material sources which are categoriezed according to specific fields of interest.

A bibliography of published and unpublished literature relating to vocational and technical education has been assembled by Corplan Associates (1966a). Entries were obtained from various journals in education, applied science and technology, dissertation abstracts, current periodicals, and numerous lists of research projects. The document contains almost 2,000 entries, several of which are relative to the topic of instructional materials and devices.

A national seminar on educational media in vocational and technical education was described and discussed by Cotrell (1967). His report includes papers presented at the seminar plus the reports of panel reaction sessions and reports from the various "interest group" sessions. The summary report was prepared as a guide for states in sponsoring state-level seminars on the application of educational media to vocational and technical education.

The Center for Vocational-Technical Education (1965) published a set of eight guides to assist teachers in preparing post-secondary students for agricultural chemical occupations. The guides were developed by a task force using data from various state studies. Each section includes subject matter content, teaching-learning activity, instructional materials, references, and suggestions for occupational experiences. The guides also include a glossary of terms, a list of selected references, instructions for specific demonstrations and appropriate use of visual aids. The guides are concerned with the use of chemicals as: fertilizers; insecticides—plants; soil additives; fungicides, bactericides, and nematocices; herbicides; plant regulators; and the use of chemicals in the field of farm animal health (nutrition, entomology, pathology).

FACILITIES

Adequate educational facilities are basic to good technical education. To be effective, most technical programs require more extensive and more specialized laboratories and general plant facilities than do other types of educational programs. Consequently, a higher degree of organized planning is necessary for their development. Unfortunately, little definitive research has been conducted to establish criteria for effective facility planning. Several publications, however, are available which provide various degrees of guidance for planning and developing such facilities.

Jacoby (1966), in cooperation with the Pennsylvania State Department of Public Instruction, has developed and published a manual entitled *Building Facilities—Design, Planning, Equipping, Financing, Vocational, Industrial, Technical Education.* This manual suggests general educational procedures and provides a reference guide for teachers, administrators, architects, and shop building specialists for planning the technical school building. General planning steps and average time requirements for construction and financing are given. Recommendations for building sizes and special space requirements, general principles of laboratory layout and design, and many other important aspects of planning are also included.

Another facility planning guide has been developed by the Wisconsin State Board of Vocational and Adult Education (1964). This guide provides specific information to be used by local school personnel for planning vocational, technical, and adult education facilities. Steps in facility planning, complete planning details, a planning checklist, guideline standards for space requirements, architect selection, and other important aspects of facilitiy planning are covered in the guide.

Chase (1965) developed a basic planning guide for vocational and technical education facilities which includes definitions, checklists, diagrams, and charts for facility planning. This manual gives criteria for determining building needs, for selecting consultants, for site suitability, and for other appropriate factors in planning.

A publication by Teske (1965) makes innovative suggestions for planning instructional space, for the production laboratory, for communications and resource materials, and for specific job training programs.

A more recent publication by McIntosh (1968) presents specific information for planning technical education facilities for programs in data processing. The author gives considerable attention to planning instructional areas by modes of learning. The three modes he suggests are reaction learning, interaction learning, and action learning. He also discusses the distinct types of instructional areas required in data processing programs and breaks these down into quantitative and qualitative facility needs.

A document prepared by Brooking and Ducat (1968) treats the topics of laboratory and library needs for technical education and includes suggestions for planning such facilities.

A report by McKee (1966) describes the use of PERT as a planning tool for educators and documents its use in establishing a technical college. The report presents in narrative and graphic form the background for establishing the college, the steps in planning, constructing, equipping, and furnishing the physical plant. This report may prove useful to those involved in facility planning.

RESEARCH

Technical education is relatively new in comparison with traditional types of education. Obvious growth patterns are emerging, however, which are helping to define it more clearly as an integral component of America's total education system. This has resulted in part from the conscientious efforts of educators who believe that technical education, to be truly significant, must constantly search for newer and better ways to meet the needs of today's technological society.

Several individuals and groups have been active in determining needs and priorities for research in technical education at both the state and the national levels. This is exemplified in a study by Miller (1967a) which describes the results of a national research planning conference to identify research and development needs in emerging technician occupations. The report describes emerging technical occupations for: (a) systems analyst technicians, (b) programming technicians, (c) education technicians, (d) animal health technicians, and (e) administrative science technicians. Leadership development, up-dating teachers, improving communications with employers, recruitment and preparation of technical teachers, definition of technical education's role in the high school, and student selection for technical education programs were identified as critical problem areas in the development of educational programs for emerging technologies.

The Michigan Vocational Research Coordinating Unit (1966) conducted a survey to identify needs and priorities for vocational and technical education research and development in that state. Items such as teacher education, counseling, placement and follow-up, curriculum, and communications were listed as high priority areas and recommendations were made for proposal development and funding.

Realizing the need for organized and coordinated research, Courtney (1966) conducted a study to identify a starting point for research efforts in Wisconsin's vocational-technical education system. The survey solicited information from directors of more than sixty schools in the state which offered vocational-technical programs and identified 14 major categories relating to occupational opportunities, human resources, and educational resources. Among the 14 categories were such topics as: (a) jobs requiring occupational education, (b) competences needed for job entry, job retention, and advancement, (c) motivational factors to encourage the socio-economically handicapped to pursue occupational education and to seek employment, (d) improvement of the local vocational education image, (e) coping effectively with career changes, and (f) curriculums for emerging technologies.

Moss (1964) conducted a study in Minnesota to determine priorities for research in that state's occupational education system. The results of his study established guiding principles of problem selection for potential researchers and identified criteria for assisting the state in distributing its research funds.

Valid instruments and operational procedures are of utmost importance for conducting effective and significant research. In an effort to contribute to this need, Armstrong and Whitney (1966) developed procedures, interview forms, and data collecting instruments for use in studies of student selection practices, admission policies, and follow-up activities. These materials were tested in a pilot study and deemed by their developers to be satisfactory for large-scale studies of this type.

A monograph by Harris (1967) describes some of the technical education developments to date and makes recommendations for future research on the "real entry requirements" of industry, the apprenticeship system, and training programs in industry. He also recommends more research in such areas as status and proper use of technicians, the suitability of various instructional media, the general education component of occupational curriculums, and open-ended curriculums for job entry or for transfer.

Christenson (1966) reports the results of a seminar to assist Research Coordinating Unit personnel and other educational leaders in fulfilling their roles of planning and conducting comprehensive programs of research and development in vocational education.

A report by the Bureau of Occupational Education Research (1967) describes an interstate cooperative research effort between New York and Connecticut. Studies were conducted to find solutions for major vocational-technical education problems confronting their common regional area and to develop a framework for a regional approach to research efforts. The re-

port states that these studies have clearly indicated the feasibility of projects being funded and operated across state lines.

Many people have recognized the need for interdisciplinary research in technical education. Lewis and Heiserman (1966) became involved in a multiphase study in interdisciplinary research and made a survey of psychological research which was applicable to vocational and technical education. The survey revealed a broad range of studies which the authors then organized and categorized into relevant subject areas. Their report on the first phase of the project describes research studies in two areas of student characteristics (levels of aspiration and vocational interests) and discusses their implications for teaching and research in vocational and technical education.

Several topics relating to vocational and technical education in nonmetropolitan areas of the midwest were analyzed by Thomas (1966). The project consisted of two main categories—strategic intelligence and research activities. The major concern in each category was with problem conceptualizations and interdisciplinary research. The *strategic intelligence* unit dealt with perception, assessment, and articulation of the social environment as it impinges upon vocational and technical education. The *research activities* unit pursued activities in human resources development, occupational opportunities, and educational resources development. Problems were examined which affected educational definitions, educational inputs, models of analysis and conceptualizations, training and development programs, and administrative policies. Specific recommendations were made for future educational research, for educational programs, and for possible integration of the two.

Lester (1966) reported on a national vocational-technical education seminar on research and curriculum development. The seminar participants analyzed existing research methods which were believed to be useful in controlling curriculum variables. Several papers were presented which identified particular problem areas and set the stage for the seminar discussions.

The results of a national vocational-technical education seminar on occupational mobility and migration were reported by Beard (1966). The seminar participants came from twenty-three different states to study and discuss the problems peculiar to occupational mobility and migration. Several papers were presented on such topics as manpower adjustments, manpower supply and requirements, differentials in spatial mobility, social-psychological dimensions of occupational mobility, and other aspects relating to this rapidly developing phenomenon of employment.

The Oklahoma Research Coordinating Unit (1969) conducted a national conference on research to discuss the implementation of the Vocational Education Act of 1963, as amended by the Vocational Education Amendments of 1968. The purpose of the conference was to determine the role and the direction of research in the development of local and state vocational-technical education programs. The *Proceedings* of the conference presents all of the papers presented including summaries of the small group discussions.

Pratzner and Faurot (1968) compiled a report on Minnesota's occupational education research studies which were conducted between 1965 and 1967. The purpose of the review and subsequent report was to analyze, summarize, and disseminate information on the current status of the state's research and development in this field. The authors indicate directions which research and development efforts might profitably pursue in the future, major problems areas which still remain relatively unexplored, and availability of the reports which they reviewed.

SUMMARY AND CONCLUSIONS

A number of significant developments have occurred in the field of technical education during the three-year period covered by this review. Enrollments have grown, new programs have been developed, and research activities have multiplied. Also, several institutions have expanded their technical education offerings, other institutions have begun to offer technical education programs, and the concept of technical education has broadened to encompass programs in areas other than engineering. Growth and expansion during this period may possibly have been greater than during any other three-year period. This growth has brought about an increased need for research and development in the field of technical education.

Practitioners looking to research for solutions to operational problems may be disappointed since the reported research offers relatively little to aid in the immediate solution of persistent problems. For example, a number of studies dealing with the identification of manpower needs at the national and state level have been reported during the last decade. While studies of this type have proved useful for identifying trends and calling attention to educational needs, their value for planning educational programs at the local level has often been limited. One of the more obvious limitations relates to the geographical areas included in these studies. National demand data reported by Rosenthal (1966), for example, can be used only as reference data at the state and local levels. A somewhat more serious limitation is created by the problem of defining and identifying technical occupations. This problem affects the study results in at least two important ways: (1) accuracy of the demand data and (2) usefulness of the data for curriculum planning. Several techniques have been used, with varying degrees of success, by investigators dealing with this problem. The briefing-conference technique reported by Roney and Braden (1968) is somewhat unique and may prove useful in other situations. Possibly the most serious limitation of manpower studies is the time element. In general the time required for educational systems to respond to an identified need is quite long; therefore, for maximum usefulness, manpower demand projections must be made for a period of several years. As for forecast horizon or period of time to which the forecast applies is increased the forecast accuracy is reduced, thus reducing the value of the information for educational planning and policy making. Researchers dealing with manpower demand at the local level also are faced with the problems of definitions and accurate long range forecasting.

It is extremely difficult, if not impossible, to make accurate long-range projections of manpower demand; therefore, it would seem that considerable effort should be devoted to reducing the response time. Based on the limited amount of reported research in this area, however, this does not seem to be an important area of concern to researchers. McKee's (1966) documentation of the use of PERT to aid in establishing a technical college is one of the few reports relating to this topic. The Technical Education Research Center at Cambridge, Massachusetts, has initiated projects in the fields of bio-medical equipment technology and electromechanical technology which are designed to develop methods and procedures to reduce the response time for implementing educational programs in emerging technologies. These projects are based upon information obtained in the two studies related to this topic which are cited in the section on manpower needs.

The several articles and studies cited in the sections on curriculum and educational programs provide support for the contention that the concept of technical education has broadened to include programs in several areas other than engineering. The rather large number of studies dealing with curriculum is encouraging. Several studies such as those by Schill and Arnold (1965), Brame (1967), and Fullerton and others (1966) have attempted to identify knowledge and skill requirements which are common to several technical occupations. This notion which has been very popular during recent years seems to hold considerable potential for improving the quality, effectiveness, and efficiency of educational programs. It is disappointing, therefore, that few, if any, development and demonstration programs for testing and evaluating the soundness of this concept are not reported in the literature.

Fundamental to the development of effective educational programs is the identification of the students to be served. Although technical education is relatively young there are some who contend that technical students have certain identifiable characteristics.

To date, research findings relating to this are too limited to support conclusions. Hoyt's (1968) work tends to indicate that technical students have certain social and psychological characteristics that should be considered by curriculum planners. The most serious limitation of this project, one of the few longitudinal studies in technical education, is that it has been primarily concerned with students in private schools. Brown's (1967) findings relative to technicians' attitudes toward social studies courses suggest that student abilities, interests, and aptitudes should be considered by those responsible for providing general education experiences for technical students. In view of the number of articles calling attention to the proper role of general education courses in technical curricula, it is somewhat surprising to find that very little research has been completed in this area. Studies to develop viable and effective general education experiences for technical students could make significant contributions to the field.

In general much of the reported research suffers from deficiencies in design and methodology. Some researchers have forged ahead without

giving proper attention to sound research design; resulting in findings that have only limited generalizability. In other cases, information for proper evaluation of findings within the framework of acceptable research design is not reported. In some instances, results are reported in such a manner that it is difficult for the reader to identify results or conclusions.

Several descriptive research studies are reported. These studies, in general, have limited value beyond the situation in which they were conducted. In some studies the researcher was attempting to describe a rapidly changing scene. Consequently, it was difficult to draw conclusions or make recommendations.

Questionnaires and opinionnaires were used in a number of studies. Information relative to the development and validation of these instruments is often limited or not reported.

Development and demonstration projects hold considerable potential for producing information that has immediate application in operational situations. Results of such projects may provide information, materials, or techniques which will aid in improving the efficiency and effectiveness of educational programs. There are disappointingly few studies of this type reported in the literature.

A number of research studies have dealt with small segments of large problems and have tended to be terminal in nature. One of the major ressons for this is that research is often funded on a project basis for specific periods of time. A few longitudinal and multi-phase studies [Mitzel and Brandon (1966), Hoyt (1968), and Kinsinger and Ratner (1966)] are reported. While the results to date do not warrant conclusions, these studies are dealing with important areas of concern and should produce significant knowledge.

The amount of significant research in technical education is still quite limited. There are, however, some encouraging developments. Research provisions of the Vocational Education Act of 1963 have served as a stimulus to research activities in technical education. Several studies supported under the provisions of this Act are currently reported; however, it is possible that the full impact has not yet been realized. It is still too early to evaluate the effectiveness of recent efforts to expand and improve research in technical education. It is hoped, however, that the fruits of these efforts will make significant contributions to the important field of technical education.

BIBLIOGRAPHY[1]

(Boldface type indicates pages which cite the reference)

Advisory Council on Vocational Education. *Vocational Education: The Bridge Between Man and His Work.* Bulletin OE-80052: Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1968. **3,14,16,18**

Alden, John D. *Demand for Engineers and Technicians—1966.* New York: Engineering Manpower Commission, 1966. (ERIC ED 013 099 MF $0.50 HC $4.75) **4**

Alden, John D. *Engineering and Technician Enrollments Fall 1967. Summary Report.* New York: Engineering Manpower Commission, 1968. (ERIC ED 019 244 MF $0.75. HF $1.55) **6**

Allen, David, *et al. A Developmental Program for the Improvement of Trade-Technical Teacher Education in the Southern States.* Los Angeles: California University, 1966. (ERIC ED 011 061 MF $0.50 HC $3.80) **21**

Allen, David, *et al. Polysensory Learning Through Multi-Media Instruction in Trade and Technical Education.* Los Angeles: California University, 1968. (ERIC ED 022 458 MF $0.50 HC $3.50) **23**

American Vocational Association. *Objectives for Vocational and Technical Education in Agriculture.* Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1965. (ERIC ED 021 965 MF $0.25 HC $1.10) **12**

Anderson, Roger C. *Predicting Achievement in Technical Programs at the North Dakota State School of Science.* Grand Forks: North Dakota University, 1966. (ERIC ED 013 905 MF $0.25 HC$1.30) **16**

Armstrong, Charles W. and Whitney, George S. *The Development and Testing of Instruments and Procedures for a Study of Student Selection Practices in Technical Education Programs.* Delmar: American Technical Education Association, Inc., July, 1966. (ERIC ED 011 972 MF $0.25 HC$2.55) **27**

Arnold, Joseph P. *A Study of Recommendations for Technical Education Curricula.* Lafayette: Purdue University, 1965. (ERIC ED 016 064 MF $0.75 HC $7.00) **8**

Arnold, Joseph P., *et al. Guidelines for the Development of Baccalaureate Technical Teacher Education Programs.* Lafayette: Purdue University, 1967. (ERIC ED 018 661 MF $0.25 HC$1.00) **21**

Auburn University. *Study of Institutional Policies Regarding Acceptance of Transfer Credit From Technical-Terminal Programs in Junior Colleges.* Auburn: Auburn University, 1966. (ERIC ED 012 178 MF $0.25 HC$0.55) **17**
$4.70)

[1]Bibliographical entries followed by an ED or MP number in parenthesis are generally available in hard copy or microfiche through the Educational Resources Information Center (ERIC). This availability is indicated by the abbreviations, MF for microfiche and HC for hard copy. Order from ERIC Document Reproduction Service, The National Cash Register Company, 4936 Fairmont Avenue, Bethesda, Maryland 20014. Add a special handling charge of 50 cents to any order which totals less than $3.00 and appropriate sales tax in states where order is originated. Other reports that have not been entirely proceesed through ERIC show the issue and date of *Research in Education* that the abstract of the report is scheduled to appear. The availability of the document will be reported as part of the resume which is printed in that particular issue of *Research in Education.* Other items are obtained from the publisher on source indicated in the citation.

Bail, Joe P. and Hamilton, William H. *A Study of the Innovative Aspects of Emerging Off-Farm Agricultural Programs at the Secondary Level and the Articulation* State University of New York, 1967. (ERIC ED 012 792 MF$0.50 HC$4.70) **19**

Baldwin, Leland P. *Directory of Associations, Societies, and Organizations with Resources for Junior College Vocational-Technical Education.* Sacramento: California State Department of Education, 1966. **24**

Barlow, Melvin L. "Why National Reviews?" *American Vocational Journal,* Vol. 42, No. 9 (December, 1967) 10-11. **16**

Barlow, Melvin L., and Reinhart, Bruce. *Profiles of Trade and Technical Teachers—Comprehensive Report.* Sacramento: California State Department of Education, 1968. (ERIC ED 019 457 MF $1.25 HC$14.80) **22**

Bartlett, Robert C. "Accreditation As It Relates to Technical-Vocational Programs in Institutions of Higher Learning." *North Central Association Quarterly,* Vol. 42 (Spring, 1968) 312-315. **17**

Bass, Wilbur A. "A Study of the Impact of the Vocational Education Act of 1963 on Selected Texas Public Junior Colleges." (unpub. Ph.D. dissertation, University of Texas, 1967) **18**

Bates, Wilfred M. "An Examination of the Relationship of Selected Variables to Interstate Geographic Mobility of Technician Graduates of the Associate Degree Programs in Oklahoma." (unpub. Ed.D. dissertation, Oklahoma State University, 1968) **17**

Baysinger, Gerald. *The Fluid Power Institutes—A Pilot Program for Introducing Emerging Technologies.* Thiensville, Wis.: Fluid Power Society, 1966. (ERIC ED 012 396 MF$1.25 HC$15.95) **22**

Beard, H. G. *National Vocational-Technical Education Seminar on Occupational Mobility and Migration.* Raleigh: North Carolina State Universotu, 1966. (ERIC ED 015 263 MF $1.00 HC$12.30) **28**

Beaumont, John A., *et al. Civil Technology: Highway and Structural Options.* Bulletin OE-80041: Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1966. (ERIC ED 012 338 MF $0.50 HC $5.85) **10**

Bell, A. P. *Institute on Critical Issues in Vocational and Technical Teacher Education in Small Colleges and Universities. Center Seminar and Conference Report Number 8.* Raleigh: North Carolina State University, 1967. (ERIC ED 020 425 MF $1.00 HC $10.45) **21**

Bettina, A. C. *Vocational-Technical Education in New Mexico Work Project No. 7.* Santa Fe: New Mexico Occupational Research and Development Coordinating Unit, 1968. (ERIC ED 022 047 MF $0.25 HC $1.90) **19**

Bishop, Richard and Sheebe, Gordon. *The Role of the Community College in Developing Traffic Specialists and Technicians.* Washington, D.C.: American Association of Junior Colleges, 1968. **11**

Bjorkquist, David C. *Effects of Field and Job Oriented Technical Training on Manpower Utilization of the Unemployed.* University Park: The Pennsylvania State University, 1968. **18**

Bottoms, James E. *Developing a Program of Student Personnel Services for Area Vocational-Technical Schools. Phase I Report.* Atlanta: Georgia State Department of Education, 1966. (ERIC ED 018 599 MF $1.00 HC $13.40) **14**

Brame, William E. "Building Construction Technology with Implications for Technical Training in the Kansas City Labor Market Area." (unpub, Ph.D. dissertation, University of Missouri, 1967) **9,30**

Brewin, Charles E., Jr. and Parker, John K. *Final Report of the Study of Post High School Educational Needs in Bucks County 1968-1980. Volume I.* Doylestown: Bucks Country Superintendent of Schools Office and the Government Studies Center of the Fels Institute of Local and State Government, University of Pennsylvania, 1968. (ERIC ED 018 672 MF $1.00 HC $12.95) **19**

Brick, Michael. *An Analysis of Selected Business and Technology Programs in High Schools and in Two-Year Colleges and Institutes of New York State with a View Toward Initiating Articulation Procedures in Counterpart Offerings.* New York: Center for Urban Education, 1967. (ERIC ED 012 791 MF $0.50 HC $5.85) **6**

Brogley, Edward R. "Counselor and Student Perceptions of Educational Information Needs in the Selection of Specialty Oriented Schools." (unpub. Ph.D. dissertation, University of Iowa, 1967) **14**

Brooking, Walter J., *et al. Electronic Technology, A Suggested Two-Year Post High School Curriculum.* Bulletin OE-80009a: Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1966. (ERIC ED 013 309 MF $0.50 HC $5.80) **9,24**

Brooking, Walter J. and Chapman, Kenneth. *Conference on Chemical Technicians: Curriculum Development and Student Recruitment.* Washington, D.C.: Office of Education, Department of Health, Education, and Welfare (October 27-28, 1967). (ERIC ED 021 531 MF $0.25 HC $2.85) **10**

Brooking, Walter J. and Ducat, Alexander C. *Criteria for Technician Education, A Suggested Guide.* Bulletin OE-80056: Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1968. **3,8,18,26**

Brown, Bill Wesley. *Characteristics of Outstanding Engineering Technicians in Arizona.* Flagstaff: Northern Arizona University, 1967. (ERIC ED 016 840 MF $0.50 HC $5.70) **17,30**

Broudy, Harry. "Problems and Prospects in Vocational Education." Paper presented to the National Leadership Development Institute in Technical Education, University of Illinois, Urbana. Institute sponsored by: The Center for Research and Leadership Development in Vocational and Technical Education, Ohio State University (June, 1966). **3**

Bureau of Occupational Education Research. *A Developmental Project for Interstate Research. Demonstration, Training, and Pilot Programs in Vocational-Technical Education.* Albany: New York State Education Department, March, 1967. (ERIC ED 019 515 MF $0.25 HC $0.60) **27**

California State Department of Education. *A Survey of Dental Assistaing Curricula in the California Junior Colleges, Preliminary Draft.* Sacramento: The Department, 1966. (ERIC ED 012 598 MF $0.25 HC $2.45) **6**

Carrol, Adger B. and Ihnen, Loren A. *Costs and Returns of Technical Education, A Pilot Study.* Raliegh: North Carolina State University, 1966. (ERIC ED 015 247 MF $0.25 HC $2.95) **18**

Center for Vocational Education. *The Use of Chemicals as Fertilizers, Agricultural Chemicals Technology No. 1.* Columbus: Ohio State University, 1965. (ERIC ED 013 895 MF $0.50 HC not available) **25**

Chan, Gordon L. *The Education and Training of Marine Technicians.* Washington, D.C.: American Association of Junior Colleges, 1968. **13**

Chase, William W. *Basic Planning Guide for Vocational and Technical Education Facilities.* Washington, D.C.: Office of Education, U.S. Department of Education, 1965. (ERIC ED 018 095 MF $0.25 HC $2.15) **26**

Christensen, Virgil E. *National Vocational-Technical Education Seminar on the Development and Coordination of Research by State Research Coordinating Units.* Columbus: The Ohio State University (February, 1966). (ERIC ED 011 042 MF $0.50 HC $4.45) **27**

Clark, Raymond M. *Grain, Feed, Seed, and Farm Supply Technology.* Bulletin OE-81014: Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1968. **12**

Clary, Joseph R. and Woodin, Ralph J. *Guidelines for the Development of Training Programs for Agricultural Technicians, A Research Report of a Graduate Study.* Columbus: The Ohio State University, 1965. (ERIC ED 012 753 MF $0.50 HC $3.10) **20**

Corplan Associates. *A Bibliography of Published and Unpublished Vocational and Technical Education Literature,* Chicago: Illinois Research and Development Coordination Unit, 1966a. (ERIC ED 018 531 MF $1.00 HC $11.35) **5**

Corplan Associates. *Survey of Information on Vocational and Technical Education in the State of Illinois. Final Report.* Springfield: Illinois Research Coordinating Unit, 1966b. (ERIC ED 018 567 MF $0.50 HC $5.25) **5,24**

Costner, John K. and Ihnen, Loren A. "Program Evaluation." *Review of Educational Research.* Vol. XXXVIII, No. 4 (October, 1968) 417-433. **16**

Cotrell, Calvin J. *Educational Media in Vocational and Technical Education, A Reprot of a National Seminar.* Columbus: The Ohio State University, 1967. (ERIC ED 017 730 MF $1.00 HC $12.85) **25**

Cotrell, Calvin J. and Valentine, Ivan E. *National Leadership Development Institutes in Technical Education.* Columbus: The Ohio State University, 1967. (ERIC ED 011 932 MF $0.75 HC $8.00) **20**

Courtney, E. Wayne. *Research Needs in Vocational-Technical Education.* Menomonie: Stout State University, 1966. (ERIC ED 020 410 MF $0.25. HC $2.75) **27**

Davis, Richard W. "Accrediting Technical Programs." *North Central Association Quarterly,* Vol. 40, No. 3 (Winter, 1966) 272-275. (ERIC ED 015 753 MF $0.25 HC $0.30) **17**

Defore, Jesse J. "An Evaluation of Baccalaureate Programs in Engineering Technology." *Trends in Engineering Technician Enrollments and Graduates.* New York: Engineering Manpower Commission, 1967, 40-48. (ERIC ED 014 298 MC $0.50 HC $3.70) **6**

Department of Health, Education, and Welfare. *Manpower for the Medical Laboratory, A Report of a Conference of Government and the Professions in Washington, D.C.* Public Health Service Publication No. 1771. Washington, D.C.: U.S. Department of Health, Education, and Welfare, 1967. (ERIC ED 021 517 MF $0.25 HC not available) **4**

Department of Health, Education, and Welfare. *Occupational Criteria and Preparatory Curriculum Patterns in Technical Education Programs.* Bulletin OE-80015: Washington, D.C.: U.S. Department of Health, Education, and Welfare, 1962. (ERIC ED 016 MF)0.25 HC not available) **4**

Dobrovolny, Jerry S. *Electronic Technology, A Suggested Two-Year Post-High School Program. Six-Quarter Program.* Urbana: University of Illinois, 1967. (ERIC ED 014 302 MF $0.50 HC $4.85) **8**

Dobrovolny, Jerry S., *et al. Horological and Micro-Precision Project.* Urbana: University of Illinois, 1968. (ERIC ED 022 927 MF $1.00 HC $13.10) **14**

Fielding, Marvin R. "Directors of Vocatioal-Technical Education in the Public Junior Colleges." (unpub. Ed.D. dissertation, University of Missouri, 1966) **20**

Foecke, Harold A. "Four-Year Engineering Technology Programs in Perspective." *Trends in Engineering Technician Enrollments and Graduates.* New York: Engineering Manpower Commission, 1967, 34-39. (ERIC ED 014 298 MF $0.50 HC $3.70) **6**

Fullerton, Bill J., *et al. The Identification of Common Courses in Paramedical Education.* Tempe: Arizona State University, 1966. (ERIC ED 010 190 MF $0.75 HC $8.70) **13,30**

Graney, Maruice R. *The Technical Institute.* New York: The Center for Applied Research in Education, Inc., 1964. 88p. **15**

Grede, John F. *Survey of Occupational Programs in Illinois Community and Junior Colleges 1967-1968.* Chicago: Illinois Association of Community and Junior Colleges, 1968. (ERIC ED 019 950 MF $0.25 HC $0.70) **5**

Green, Kinsey. *Final Report Leadership Development Seminar On Vocational-Technical Education.* College Park: University of Maryland, 1966. (ERIC ED 010 630 MF $0.75 HC $8.20) **20**

Hakanson, John W. *Selected Characteristics, Socioeconomic Status, and Levels of Attainment of Students in Public Junior College Occupation-Centered Education.* Berkeley: University of California, 1967. (ERIC ED 013 644 MF $0.25 HC $2.45) **15**

Halterman, Jerry, *et al. Agricultural Chemicals Technology, A Suggested Two-Year Post High School Curriculum and Course Outlines.* Columbus: The Ohio State University, 1965. (ERIC ED 013 894 MF $0.75 HC $7.55) **11**

Harris, Norman C. "The Accreditation of Technical Schools—An Analysis of Some Major Issues." *North Central Association Quarterly,* Vol. 42 (Spring, 1968) 316-321. **17**

Harris, Norman C. *Developments in Technical and Vocational Education.* Durham: Duke University, April, 1967. (ERIC ED 013 098 MR $0.50 HC $6.30) **17,27**

Hartung, Walter H. "The Establishment of ECPD Accreditation for Baccalaureate Programs in Engineering Technology." *Trends in Engineering Technician Enrollments and Graduates.* New York: Engineering Manpower Commission, 1967, 49-52pp. (ERIC ED 014 298 MF $0.50 HC $3.70) **18**

Haynes, William O. *Suppermarket Management.* Washington, D.C.: American Association of Junior Colleges, 1968. **11**

Hensel, James W. *Agricultural Programs at the Post-High School Level; A Special Report Prepared for the Pacific Regional Seminar in Agricultural Education* (Olympia, May 15-19, 1967). Columbus: The Ohio State University, 1967a. (ERIC ED 022 842 MF $0.50 HC $4.60) **5**

Hensel, James W. *The Demand for and Selected Sources of Teachers in Vocational and Technical Education, State Director Survey.* Columbus: The Ohio State University, 1967b. (ERIC ED 012 331 MF $0.50 HC $4.25) **21**

Hensel, James W. *Enlisted Men Separating from the Military Service as a Potential Source of Teachers for Vocational and Technical Schools.* Columbus: The Ohio State University, 1967c. (ERIC ED 016 131 MF $0.25 HC $2.90) **22**

Hoover, Norman K., et al. *Off-Farm Agricultural Occupations in Pennsylvania, Employment Opportunities and Technical Education Needs.* University Park: Pennsylvania State University, 1966. (ERIC ED 012 310 MF $0.25 HC $2.15) **5**

Hopfengardner, Jerrold D. *Ohio Public Technical Education Notebook.* Columbus: State of Ohio Department of Education, 1967. **15**

Householder, Daniel L. "Techniques and Modes of Instruction." *Review of Educational Research,* Vol. 38, No. 4 (October, 1968) 382-394. **23**

Hoyt, Danald P. "Predicting Grades in Two-Year Terminal Programs." *Junior College Journal,* (February, 1966) 20-23. **16**

Hoyt, Kenneth B. "The Specialty Oriented Student Research Program: A Five-Year Report." *Vocational Guidance Quarterly,* Vol. 16 (March, 1968) 169-176. **14,15, 30,31**

Hoyt, Kenneth B. and Cochran, Lee W. "Communicating Guidance Information to Specialty Oriented Students." *Audiovisual Instruction,* Vol. 10 (January, 1965) 49-53. **15**

Iowa State Department of Public Instruction. *Guidlines for the Development of Merged Area Vocational Technical Schools and Area Community Colleges by the Merged Area Boards.* Des Moines: The Department, 1966. (ERIC ED 018 584 MF $0.25 HC $1.75) **20**

Jacobson, Eckhart A. and Swanson, Merlyn. *A Survey of the Technical Needs of Industry and Implications for Curriculum Development in Higher Education.* DeKalb: Northern Illinois University, 1966. (ERIC ED 010 257 MF $1.00 HC $12.30) **5**

Jacoby, Robert. *Building Facilities—Design, Planning Equipping, Financing. Vocational, Industrial, Technical Education.* Harrisburg: Pennsylvania State Department of Instruction, April, 1966. (ERIC ED 016 058 MF $0.25 HC $1.80) **25**

Johnson, Bernadine. *Review of Recent Research on Methods of Teaching,* 1965. (ERIC ED 019 450 MF $0.25 HC $1.45) **24**

Kahler, Carol, *et al. A Guide for Health Technology Program Planning.* Washington, D.C.: American Association of Junior Colleges and New York: National Health Council, 1967. (ERIC ED 013 114 MF $0.25 HC $2.85) **20**

Kansas City School District. *Industry—Education—Business: Wyandotte County Survey.* Kansas City: The School District, 1967. (ERIC ED 021 533 MF $0.75 HC $8.15) **19**

Kaufman, Jacob J. and Brown, Anne F. "Manpower Supply and Demand." *Review of Educational Research,* Vol. XXXVIII, No. 4 (October, 1968), 326-345. **4**

Kinsinger, Robert E. *Education for Health Technicians—An Overview.* Washington, D.C.: American Association of Junior Colleges, 1966. (ERIC ED 011 779 MF $0.25 HC $1.90) 36p **20**

Kinsinger, Robert E. and Ratner, Muriel. *Technicians for the Health Field—A Community College Health Careers Study Program.* Albany: New York State Education Department, 1966. (ERIC ED 011 198 MF $0.50 HC $3.00) **13,31**

Kishkunas, Louis J. *Pittsburg Technical Health Training Institute Demonstration Project. Final Report. Volume I.* Pittsburg: Pitsburg Board of Public Education, 1967a. (ERIC ED 019 508 MF $0.50 HC $3.35) **12**

Kishkunas, Louis J. *Pittsburg Tecnnical Health Training Institute Demonstration Project. Final Report Volume II.* Pittsburg: Pittsburg Board of Public Education, 1967b. (ERIC ED 019 509 MF $0.75 HC $9.85) **12**

Knoebel, Robert M. *et al. Food Processing Technology.* Bulletin OE-82016: Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1967. **13**

Knoebel, Robert M. *et al. Metallurgical Technology.* Bulletin OE-81012: Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1968. **10**

Kover, Edgar A. "Training Nuclear Technicians." *School Shop,* Vol. 26, No. 7, (March, 1967) 58-59. (ERIC ED 015 750 MF $0.25 HC $0.30) **10**

Kurth, Edwon L. and Gianini, Paul C. *Professional Competencies of Teachers of Technical Education in Florida.* Tallahassee: Florida State Department of Education, 1967. (ERIC ED 017 687 MF $0.50 HC $3.90) **22**

Laws, Norman C. *Mathematical Expectations of Technicians in Michigan Industries, A Special Vocational Education Research Project.* Lansing: Michigan State Department of Public Instruction, 1966, (ERIC ED 017 637 MF $0.50 HC $3.10) **10**

Lee, Allen. *A Nationwide Study of the Administration of Vocational Technical Education, At the State Level. Interim Report.* Berkeley: University of California, 1967. (ERIC ED 017 677 MF $0.75 HC $7.30) **19**

Lee, Allen and Hamlin, Herbert M. "Organization and Administration." *Review of Educational Research,* Vol. XXXVIII, No. 4 (October, 1968), 394-404. **19**

Lee, Arthur M. *Engineering and Technology in Arizona.* Flagstaff. Northern Arizona University, 1968. **19**

Lescardeau, Roland F., *et al. Development of a Curriculum to Meet Changing Manpower Needs of the Computer and Business Machines Industries.* Hartford: Technical Education Consortium, Inc., 1968a. (ERIC ED 022 926 MR $0.50 HC $5.85) **11**

Lescarbeau, Roland F., *et al. A Suggested Curriculum Guide for Electromechanical Technology Oriented Specifically to the Computer and Business Machines Field.* Hartford: Hartford University, 1968b. (ERIC ED 018 392 MF $0.50 HC $3.50) **14**

Lester, Hershel T., Jr. *Report of a National Vocational-Technical Education Seminar on Research and Curriculum Development.* Athens: University of Georgia, 1966. (ERIC ED 018 592 MF $0.75 HC $7.35) **28**

Lewis, Edwin C. and Heiserman, Mary. *The Potential Contribution of Psychology to Interdisciplinary Research in Vocational-Technical Education.* Ames: Iowa State University of Science and Technology, 1966. (ERIC ED 016 798 MF $0.25 HC $1.10) **28**

Marshall, Dwight A. and Hunt, Hiram M. *Radiation Health Technology Curriculum.* Las Vegas: Nevada Southern University, 1968. (ERIC ED 022 466 MF $0.50 HC $5.75) **13**

Martin, Robert R. *Technical Education—Less-Than-Baccalaureate Level Programs in Higher Education.* Richmond: Eastern Kentucky University, (no date). (ERIC ED 019 069 MF $0.25 HC $1.45) **6**

McComas, James D. and Willey, Darrell S. *Occupational Needs for Vocational and Technical Education for New Mexico. Summary.* Santa Fe: New Mexico State Department of Education, 1966. (ERIC ED 012 311 MF $0.50 HC $5.00) **5**

McIntosh, William A. *A Guide for Planning Facilities for Occupational Preparations in Data Processing.* Columbus: The Ohio State University, November, 1968. **11,25**

McKee, Robert L. *The Documentation of Steps to Establish a Technical College and The Evaluation of "Pert" as a Planning Tool for Educators.* Bailey's Crossroads: Northern Virginia Technical College, 1966. **26,30**

Michigan Vocational Research Coordinating Unit. *Michigan Vocational-Technical Education R and D Needs Survey. Final Report.* Lansing: Michigan State Board of Education, 1966. (ERIC ED 011 292 MF $0.25 HC $1.05) **27**

Miller, Aaron J. "Characteristics of the Technical Education Student." Paper presented at the American Technical Education Association, Denver, 1966. (ERIC ED 012 318 MF $0.25 HC $0.70) **15**

Miller, Aaron J. *Counsultants' Workshop on Technologies Related to Mechanical Engineering.* Washington, D.C.: American Association of Junior Colleges, 1968. **10**

Miller, Aaron J. *Research and Development Priorities in Technical Education, A Report of a National Research Planning Conference in Technical Education.* Columbus: The Ohio State University, 1967a. (ERIC ED 013 888 MF $0.25 HC $2.05) **21,26**

Miller, Aaron J. *Research Priorities in Technical Teacher Education.* Columbus: The Ohio State University, 1967b. **26**

Miller, Aaron J. *et al. National Program Development Institutes in Technical Education.* Columbus: The Ohio State University, 1968. (ERIC ED 022 955 MF $0.75 HC $6.80) **20**

Mills, Boyd C. and Rahmlow, Harold F. *Major Task and Knowledge Clusters Involved in Performance of Electronic Technicians' Work.* Pullman: Washington State University, 1966. (ERIC ED 010 655 MF $0.50 HC $3.65) **8**

Mississippi State University. *A Guide for Use in Developing Training Programs in Drafting and Design Technology.* State College: The University, 1965. (ERIC ED 013 306 MF $0.75 HC Not available) **24**

Mitzel, Harold E. and Brandon, George L. *Experimentation with Computer-Assisted Instruction in Technical Education. Semi-Annual Progress Report.* University Park: Pennsylvania State University, December, 1966. (ERIC ED 010 498 MF $0.50 HC $6.35) **23,31**

Moss, Jerome, Jr. *The Influence of Industrial Arts Experience on Grades Earned in Post-High School Trade and Technical Curriculums.* Minneapolis: Minnesota Research Coordinating Unit, 1966. (ERIC 012 324 MF $0.25 HC $2.00) **16**

Moss, Jerome, Jr. *A Preferred Order for Studying Current Problems in Minnesota's Trade and Technical Programs.* St. Paul: Minnesota State Department of Education, 1964. (ERIC ED 012 307 MF $0.25 HC $0.90) **27**

Moss, Jerome, Jr. *Review of Research in Vocational Technical Teacher Education.* Minneapolis: Minnesota Research Coordinating Unit, 1967. **21**

New York City Board of Education. *The Pre-Technical Project, A Demonstration in Education for Technology. Medical Technology, 11th and 12th Years.* Brooklyn: The Board, 1967. (ERIC ED 019 496 MF $1.00 HC $11.35) **7,24**

North Carolina State Board of Education. *Court Reporting (Business Technology).* Raleigh: The State Board, 1966a. (ERIC ED 013 944 MF $0.25 HC $0.65) **11,13**

North Carolina State Board of Education. *Dental Hygiene Manual, Guide for a Two-Year Post-High School Curriculum.* Raleigh: The State Board, 1967. (ERIC ED 017 707 MF $0.50 HC $3.60) **13**

North Carolina State Board of Education. *Traffic and Transportation (Business Technology).* Raleigh: The State Board, 1966b. (ERIC ED 013 945 MF $0.25 HC $0.65) **11**

Norton, Robert E. *Using Programmed Instruction in Occupational Education.* Ithaca: State University of New York, September, 1967. (ERIC ED 018 660 MF $0.25 HC $2.90) **23**

Office of Manpower Policy. *Technology and Manpower in Design and Drafting 1965-75.* Washington, D.C.: U.S. Department of Labor, 1966. (ERIC ED 020 315 MF $0.25 HC $2.35) **9**

Oklahoma Research Coordinating Unit. *Proceedings: National Conference on Research 1968 Vocational Educational Amendments.* Stillwater: Oklahoma State University, 1969. **28**

Oklahoma State Department of Education. *A Guide for Developmental Guidance.* Oklahoma City: The Department, 1968. **15**

Park, Young. "Reevaluation of the Junior College Curriculum, A Prerequisite for Instructional Innovation." A paper presented to B. Lamar Johnson, Graduate School of Education. Los Angeles: University of California, 1968. (ERIC ED 019 060 MF $0.25 HC $2.60) **17**

Phillips, Donald S. *Personal and Social Background Characteristics of Entering Technician Education Students at Four Post-High School Institutions* Stillwater: Oklahoma State University, 1968. **14**

Pickett, Louis L. *A Proposal for an Area Vocational-Technical School and Community College for Eastern Iowa.* County Boards of Education of Clinton, Muscatine, and Scott Counties, 1966. (ERIC ED 010 738 MF $0.50 HC $5.85) **19**

Pratzner, Frank C. and Faurot, Lyle. *Summary of Studies Conducted in Minnesota 1965-67.* Minneapolis: University of Minnesota, 1968. **29**

Purtzer, Wayne R. *Policies Affecting Acceptance of Transfer Credit for Courses in Technical Education.* Lincoln: University of Nebraska, 1967. (ERIC ED 019 046 MF $0.25 HC $1.35) **17**

Ray, Elizabeth M. "Social and Philosophical Framework." *Review of Eeucational Research,* Vol. XXXVIII, No. 4 (October, 1968) 309-325. **3**

Riendeau, Albert J. *The Role of the Advisory Committee in Occupational Education in the Junior College.* Washington, D.C.: American Association of Junior Colleges, 1967. (ERIC ED 017 266 MF $0.50 HC $4.00) **20**

Rihm, Alma et, al. *A Transition in Nursing Education—Guidelines Resulting from Phasing Out of a Diploma Nursing Program and the Establishment of an Associate Degree Program.* Santa Fe: New Mexico Research Coordinating Unit, 1967. (ERIC ED 017 683 MF $0.50 HC $6.40) **20**

Robb, Felix C. *We Shall Not Rest.* Atlanta: Southern Association of Colleges and Schools, 1967. **17**

Rogers, Virgil M. *Adapting Educational Change to Manpower Needs in Quincy, Massachusetts and Wood County (Parkersburg), West Virginia.* Washington, D.C.: National Education Association, 1966. (ERIC ED 015 268 MF $0.50 HC $4.85) **19**

Roney, Maurice W. *Electromechanical Technology. A Field Study of Electromechanical Technician Occupations, Part I. A Post-Hich School Curriculum Part II.* Stillwater: Oklahoma State University, 1966. (ERIC ED 012 372 MF $0.50 HC $5.05) **4,13**

Roney, Maurice W. "Technical Education's Dilemma and Higher Education's Solution." *Journal of Engineering Education,* Vol. 59, No. 7 (March, 1969) 829-839. **17**

Roney, Maurice W. and Braden, Paul V. *Occupational Education Beyond the High School in Oklahoma, An Analytical Study with Recommendations for a Statewide System for Manpower Development.* Stillwater: Oklahoma State University, 1968. (ERIC ED 020 395 MF $1.00 HC $12.55) **18,19,29**

Rosenthal, Neal H. *Technician Manpower—Requirements, Resources, and Training Needs.* Report No. BLS, Bulletin 1512. Washington, D.C.: Bureau of Labor Statistics, U.S. Government Printing Office, 1966. (ERIC ED 014 571 MF $0.50 HC $6.00) **29**

Ryan, Paul B. "Why Industry Needs the Junior College." Paper presented at the 33rd Annual Meeting of the Pacific-Southwest Section of the American Society of Engineering Education, Chandler, Arizona, December, 1967. (ERIC ED 018 222 MF $0.25. HC $0.85) **5**

Ryan, T. A. *Summer Institute to Prepare Vocational Educators in Curriculum Development.* Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, Bureau of Research, 1968. **7**

Santa Cruz County Board of Education. *Santa Cruz County Schools Student Follow-up Survey, A Manual for Use by Administrators, Counselors, Teachers, and Data Processing Personnel.* Santa Cruz: County Board of Education, 1966. (ERIC ED 018 597 MF $0.25 HC $1.35) **17**

Schaefer, Carl J. *The Advanced Degree and Vocational-Technical Education Leadership (A Symposium).* New Brunswick: Rutgers, The State University, 1966. (ERIC ED 010 015 MF $0.50 HC $3.10) **20**

Schill, William J. and Arnold, Joseph P. *Curricula Content for Six Technologies.* Urbana: University of Illinois, 1965. **7,30**

Schnelle, Karl B. Jr. *An Evaluation of a Summer Institute to Train Instructors of Instrument Technology. Final Report.* Pittsburgh: Instrument Society of America, 1967. (ERIC ED 016 129 MF $0.50 HC $3.00) **22**

Sharp, Laure M. and Krasnegor, Rebecca. *The Use of Follow-up Studies in the Evaluation of Vocational Education.* Washington, D.C.: Bureau of Social Science Research, 1966. (ERIC ED 010 072 MF $0.25 HC $2.20) **17**

Smith, Clodus R. and Connolly, Hohn. *Proceedings of National Seminar on Program Planning, Budgeting, and Evaluation, Vocational-Technical Education.* College Park: University of Maryland, 1967. (ERIC ED 018 645 MF $0.50 HC $3.30) **18**

Smith, Garrison B., *et al. The Pre-Technology Program, A Descriptive Report.* San Francisco: Cogswell Polytechnical College, 1966. (ERIC ED 016 047 MF $0.50 HC $4.40) **7**

Smith, Nathaniel D. *Status of and Need for Technical-Institute Programs in the Public Junior College.* Natchitoches: Northwestern State College of Louisiana, 1966, (ERIC ED 012 585 MF $0.25 HC $2.60) **5**

Stephenson, Don. *The Effectiveness of the Contra Costra College Electronics Program in Preparing Its Graduates for Employment as Reported by Post-Graduate Students.* San Pablo: Contra Costra College, 1968. (ERIC ED 017 271 MF $0.25 HC $0.55) **17**

Stevenson, Bill W. *Personnel Needs and Supply in Vocational-Technical Education Above Local Teacher Level.* Stillwater: Oklahoma State University, 1966. (ERIC ED 011 287 MF $0.25 HC $0.60) **20**

Sturm, Herman M. *Technology And Manpower in the Health Service Industry, 1965-75.* Manpower Research Bulletin 14. Washington, D.C.: Office of Manpower Policy, Evaluation and Research, U.S. Government Printing Office, 1967. (ERIC ED 014 555 MF $0.50 HC $5.85) **4**

Swanson, J. Chester. A Gateway to Higher Economic Levels, Vocational-Technical Education to Serve Missouri. Berkeley: University of California, 1966. (ERIC ED 019 455 MF $0.50 HC $4.00) **18**

Swanson, J. Chester. *A Nationwide Study of the Administration of Vocational-Technical Education at the State Level, Volume I.* Berkeley: University of California, 1967. (ERIC ED 016 858 MF $1.25 HC $15.90) **19**

Taylor, Robert E. *Preparing Agricultural Technicians, Report of a National Seminar on Agricultural Education.* Columbus: The Ohio State University, 1964. (ERIC ED 011 918 MF $0.75 HC $8.70) **12**

Taylor, Ronald G. and Hecker, Donald L. *Interest and Intellectural Indices Related to Successful and Non-Successful Male College Students in Technical and Associate Degree Programs.* Big Rapids: Ferris State College, 1967. **15,16**

Technical Education Research Center. *Development and Evaluation of Educational Programs in Bio-Medical Equipment Technology, Phase I.* Cambridge: Technical Education Research Center, Inc., 1967. **4,12**

Technician Education Yearbook—1967-1968. Ann Arbor: Prakken Publications, Inc., 1967, 11-91. **5**

Teel, Ward, *et al. The Need to Establish a Marine Sciences Technology Program at Shoreline Community College.* Seattle: Shoreline Community College, 1966. (ERIC ED 011 781 MF $0.25 HC $2.05) **5**

Tennyson, W. Wesley. "Career Development." *Review of Educational Research,* Vol. XXXVIII, No. 4 (October, 1968) 346-366. **14**

Ternstrom, Clinton C. *A Program for Architectural Technicians' Training.* Washington, D.C.: American Institute of Architects, 1966. (ERIC ED 019 080 MF $0.25 HC $1.20) **9**

Teske, P. *Vo-Tech Continuing Information Program.* Stanford: Stanford University, 1965. (ERIC ED 010 264 MF $0.25 HC $1.45) **26**

Thomas, Robert W. *Research and Development in Vocational and Technical Education—Non-metropolitan Areas.* Ames: Iowa State University of Science and Technology, November, 1966. (ERIC ED 011 068 MF $0.50 HC $3.55) **28**

Tuckman, Bruce W. *The Development and Testing of an Evaluation Model for Vocational Pilot Programs.* New Brunswick: Rutgers, The State University, 1967. (ERIC ED 016 083 MF $0.50 HC $5.30) **18**

Turner, Charles J., *et al. Differential Identification of Successful Technical Students in Junior College.* Ocala: Central Florida Junior College, 1966. (ERIC ED 010 501 MF $0.25 HC $2.40) **16**

U.S. Office of Education. *Medical Laboratory Assistant, A Suggested Guide for a Training Program.* Report OE-87017: Washington, D.C.: U.S. Department of Health, Education, and Welfare, 1966. (ERIC ED 013 321 MF $0.50 HC $6.25) **12**

University of New Hampshire. *Forest Technology.* Bulletin OE-80054: Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1968. **12**

Van Hall, Milo E. "The Technical Education Student." *Journal of Technology,* Vol. 6, No. 2 (Spring, 1967) unnumbered. **15**

Vasek, Richard J. *A Comparative Analysis of Electronic Content in Public Post-High School Technical Institutes and Electronics Technology Requirements of Industry.* State College: Mississippi State University, 1967. (ERIC ED 015 302 MF $0.50 HC $4.65) **9**

Venn, Grant. *Man, Education, and Work.* Washington, D.C.: American Council on Education, 1964. **3**

Venn, Grant. *Pretechnical Post High School Programs, A Suggested Guide.* Bulletin OE-80049: Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1967. (ERIC ED 019 929 MF $0.50 HC $3.85) **6**

Vocational Technical Study Committee. *Citizens' Survey of Shiawossee-Clinton County.* Ann Arbor: Michigan University, 1966. (ERIC ED 018 606 MF $0.75. HC $6.76) **19**

Warmbrod, J. Robert. *Manpower Needs and Employment Opportunities for Workers Needing Knowledge and Skill in Agriculture. Technical Education in and for Rural Areas, Report Number 2.* Urbana: University of Illinois, 1966. (ERIC ED 013 881 MF $0.25 HC $2.10) **5**

Weede, Gary D. *Electronic Technician Personnel and Training Needs of Iowa Industries.* Ames: Iowa State University, 1966. (ERIC ED 020 314 MF $0.25 HC $2.00) **5**

Weinstein, Emanuel. *Instrumentation and Automatic Control, Suggested Techniques for Determining Courses of Study in Vocational and Technical Education Programs.* Bulletin OE-80043: Washington, D.C.: Office of Education, U.S. Department of Health, Education, and Welfare, 1966. (ERIC ED 012 335 MF $0.25 HC $2.10) **9**

Wellman, Frank E. *Dimensions of Vocational Counseling—Working Papers.* Columbia: University of Missouri, 1966. (ERIC ED 011 615 MF $1.50 HC $19.65) **15**

Wenrich, Ralph C., *et al. A State Program for the Development of Persons for Leadership in the Administration of Local Programs of Vocational and Technical Education.* Ann Arbor: University of Michigan, 1968. **20**

Whitney, Larry J. "An Analysis of the Administrative Structure and the Role of the Chief Vocational-Technical Education Administrator in Public Junior Colleges." (unpub. Ed.D. dissertation, University of Missouri, 1967) **20**

Wiegman, Robert R. *General Education in Occupational Education Programs Offered by Junior Colleges.* Washington, D.C.: American Association of Junior Colleges, 1969. **17**

Wimer, Frank H. "Occupational Analysis as a Basis for Curriculum Development." (Paper presented at an institute sponsored by Colorado State University, Ft. Collins, July 29-August 2, 1968) **7**

Wisconsin State Board of Vocational and Adult Education. *Guidelines for Realistic Facility Planning for Schools of Vocational, Technical, and Adult Education.* Madison: The State Board, 1964. (ERIC ED018 602 MF $0.50 HC $4.25) 25